FOUNDRY TRADE JOURNAL

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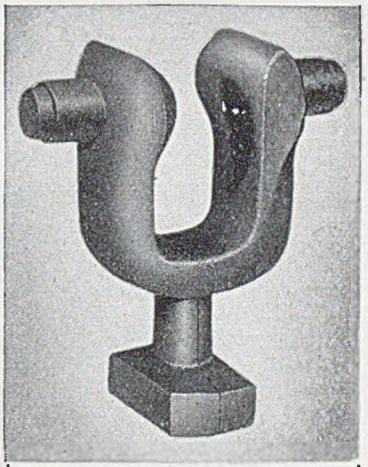
FORDATH'S WORD IS THEIR BOND

—and GLYSO is their word

GLYSO CORE BONDING COMPOUNDS combine a range with characteristics so varied as to meet exactly the requirements of any given job in the core shop. They have been in daily use in foundries large and small for many years.



Careful selection from the Glyso range of binders provides exactly the green and baked strengths required.

Semi-Solid Compounds give a high green bond covering a wide range of sand characteristics.

Creams combine a lower green bond and free-flowing mix with high baked strength; unsurpassed for core-blowing mixtures.

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Glyso XL Core Powder, a pure film-dried cereal, produces high green strength in the mix and is best used with Permol Core Oil.

Glyso—Exol Core Powders, a range of cereal powders impregnated with core oil in accurate quantities for different classes of core work.

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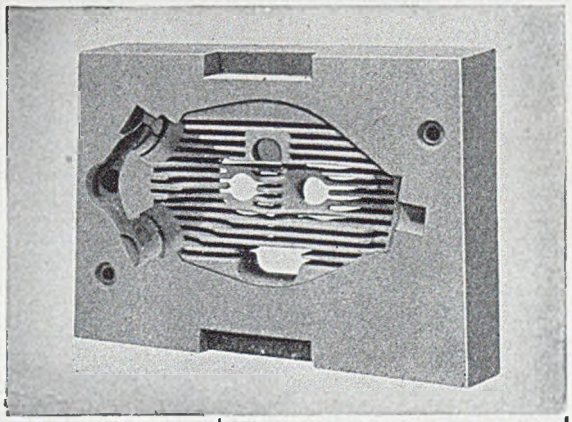

When Glyso is the bond the core makers skill is seen at its best.

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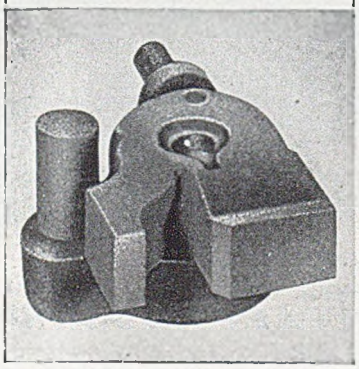
The confidence with which the core maker uses a Glyso-bonded mix is amply justified in the finished core.



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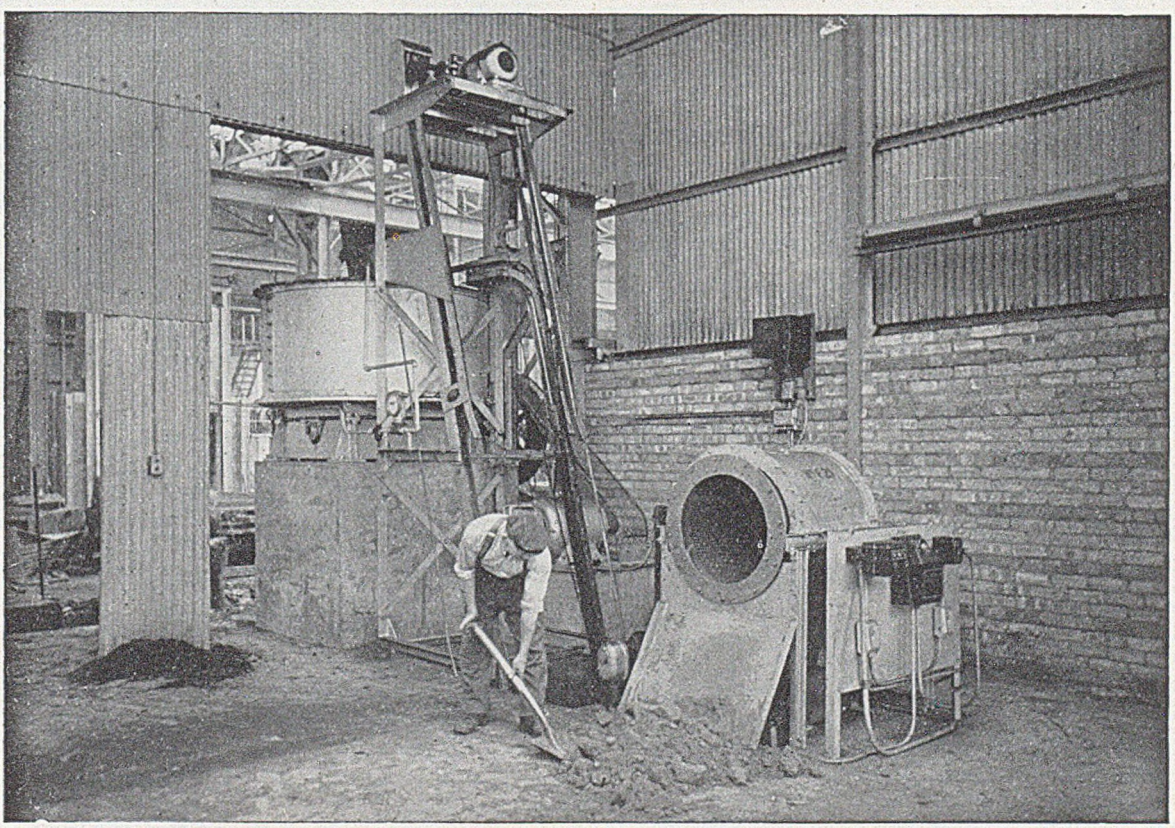
PNEULEC *facing sand plant unit*

The illustration shows our facing sand plant unit which includes shovel fed rotary screen, collecting belt conveyor, magnetic pulley, loader and 6ft. 0in. diameter mill with disintegrator. The recommended batch capacity of the plant for facing is 6 cwts. and the normal batch cycle 6 minutes. This is a standard layout and there are many successful installations operating in all parts of the world. Further information will be gladly supplied on request.



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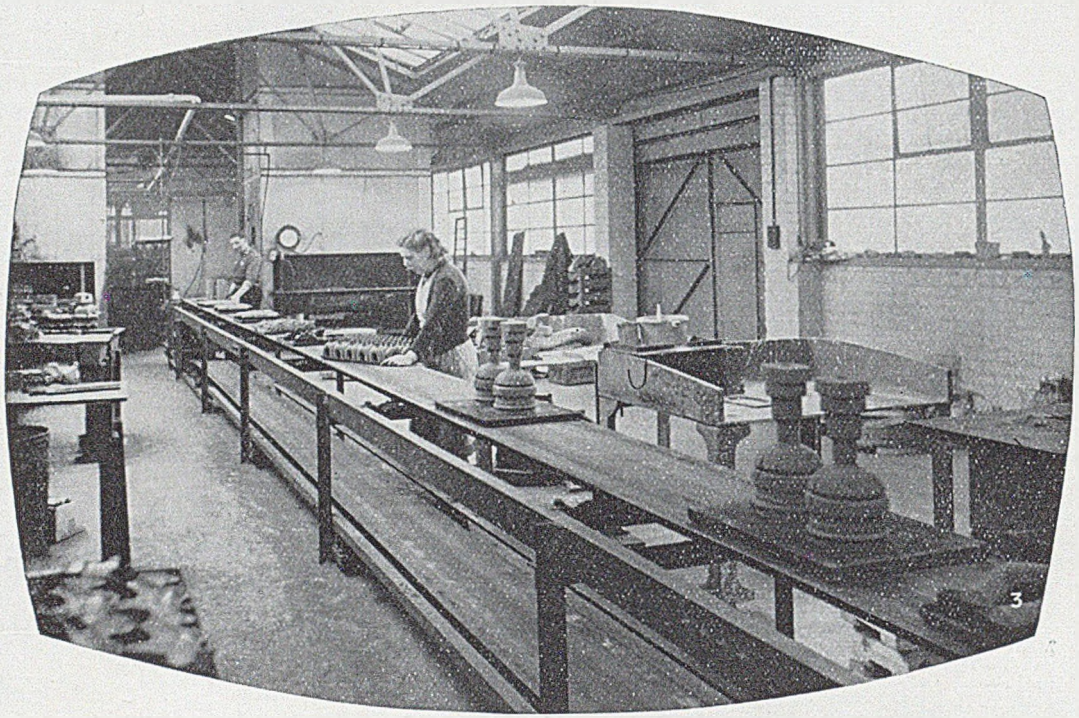

This photograph shows one of our many conveyors conveying cores from the benches to the drying stove.

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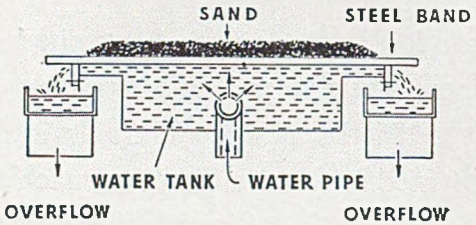

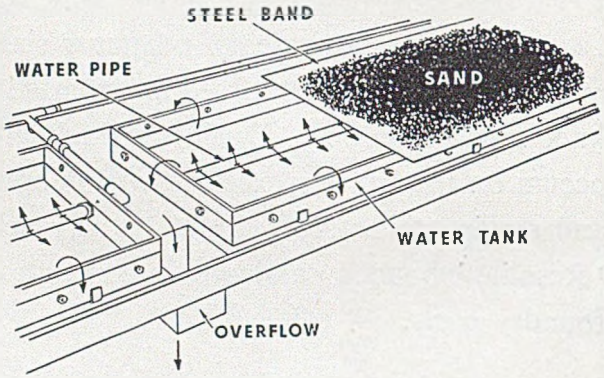

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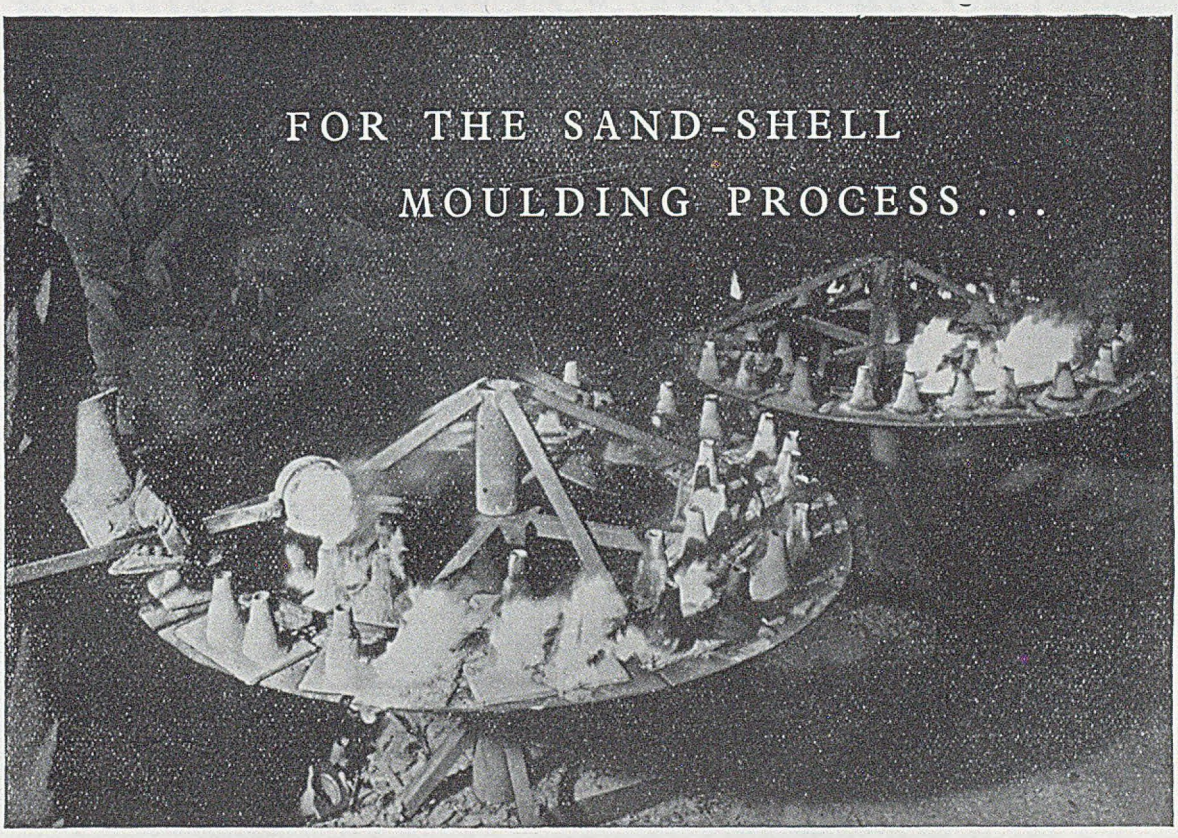

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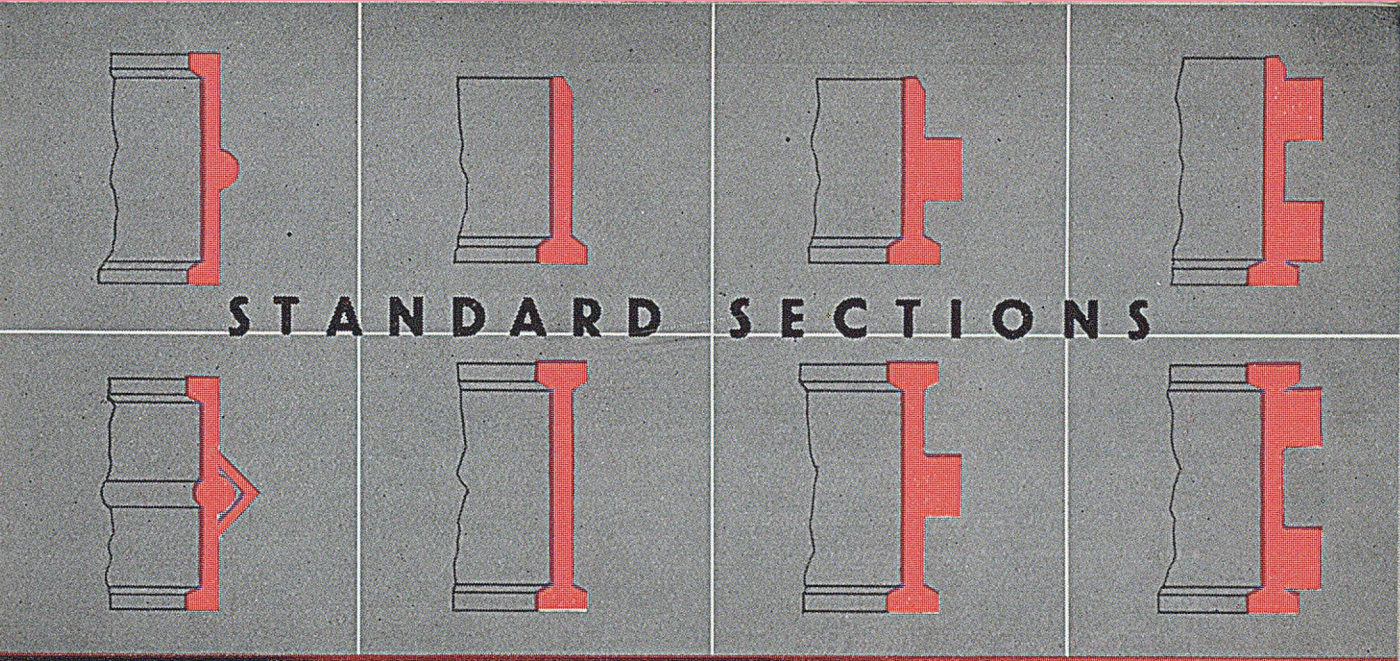

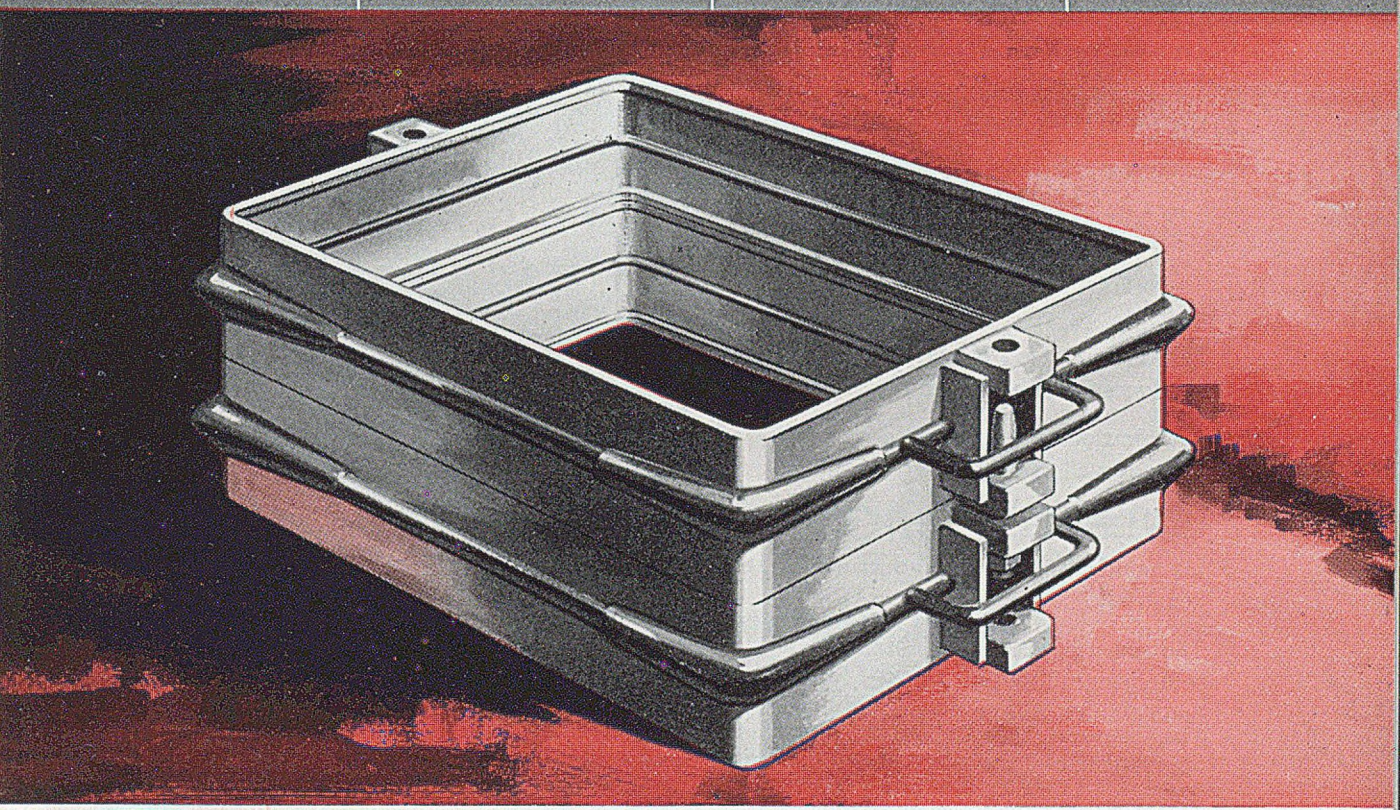

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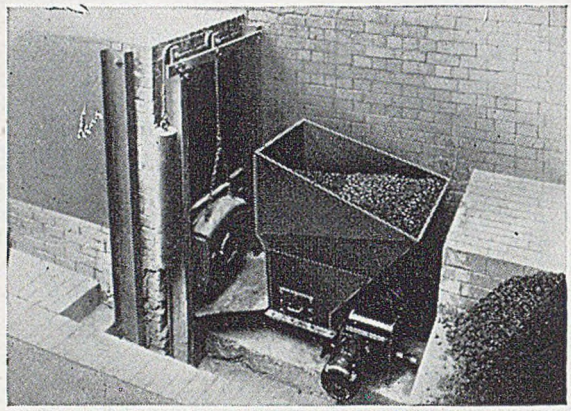

A Riley Stoker firing a Foundry Core Oven.

B-31

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Established 1902
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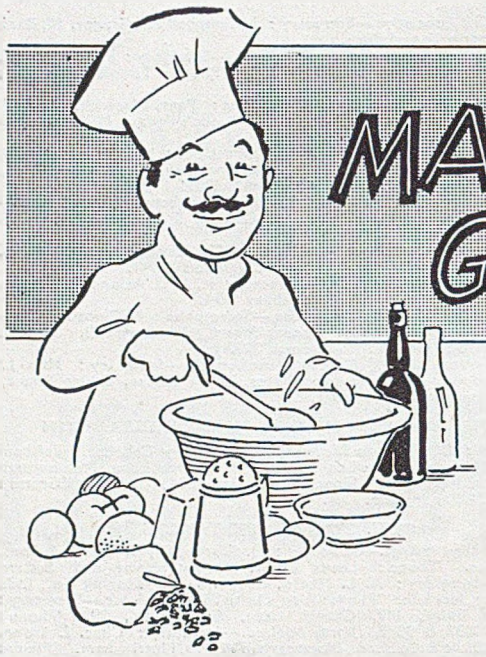

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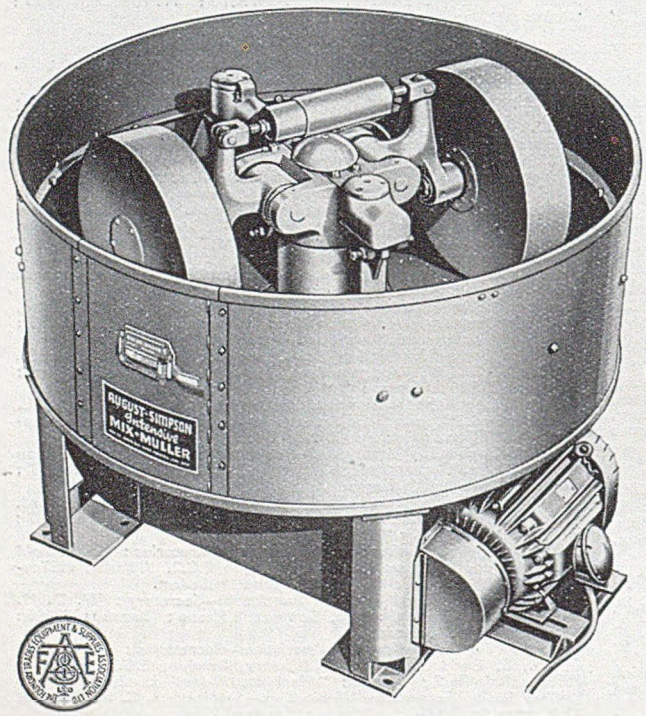
Behind those rare and splendid joys of the Festive Season lies the mastery of mixing.
But in all seasons is mastery of mixing displayed in the everyday tasks of foundry routine.

Developments in sand research and in new bonding materials have definitely indicated a trend toward greater mulling pressures. August's have now the perfect answer to this problem in the new 2F and 3F August-Simpson Mix-Mullers, which makes possible increased muller pressures with a minimum of muller inertia. This has been accomplished by using comparatively light mullers and employing a unique spring-loaded muller arrangement which allows complete adjustment for variable muller pressures.



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FOUNDRY TRADE JOURNAL

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The Art of Hiring

In a pamphlet "Interviewing for Selection,"* written by Mr. Harold F. Lock, stress is laid on the importance of this subject and the need for the interviewer to have some system in mind. The matter is presented in an interesting manner and a number of useful hints are given, yet it is limited in its scope to the selection of senior personnel. For the acquisition of the labour force, gone are the days when the foreman just went to the works' gate or the nearest street corner and made his selection—sometimes with outstanding success. In one instance we selected a man in this way who later became one of the leading steelfoundry managers of the country. We have carefully read Mr. Lock's precepts and are convinced that no trained interviewer would have elicited any background information from this man, who had descended from public-school status to a street-corner boy, only to rise again to an honourable position of great responsibility.

The essential factor in interviewing for a serious job is to bear in mind that for the applicant it is a nerveracking and important event and this demands that every effort should be made to reduce this mental strain to the minimum. A question such as "How did you like your last job?" will yield more useful information than enquiries as to what was the last job; how long were you there, and why did you leave? Again, such questions as to how holidays are spent or the last book read will reveal more of the applicant's mental make-up, ambitions, his aptitude for fitting himself into a team, and general outlook on life than a whole series of stereotyped questions. As replies are forthcoming, the interviewer must register each item against a list of information he desires to obtain.

This pamphlet suggests that, where possible, some indication should be given as to the outcome of the interview, and this personally we have found most difficult to do. The best we have achieved is to say that either the applicant has not the qualifications which are sought or to declare that he was on the short list, and that a quick decision would be made. The delegation of this job of hiring to one official can be a mistake, unless the applicant meets with the complete approbation of his immediate "boss," on whom the final decision should rest. Unless this official likes the "cut of his jib" nothing but "heavy weather" can be expected. It is up to the personnel manager to create a short list, by eliminating the obviously unsuitable and then present the particulars of the likelier ones to the actual official under whom the applicant will serve. This, of course, does not apply to the ordinary labour force. After all the efforts made by the psychologists, it does happen that the maker of the final decision may settle on "the blonde with trim figure!"

* Published by the National Institute of Industrial Psychology, 14, Welbeck Street, London, W.1, price 2s.

100 Years of Engineering

The only professional society in Britain covering all branches of engineering, the Society of Engineers, celebrates its centenary in 1954. Founded in London in 1854 as the Putney Club, for the reunion of engineers who had been educated at Putney College, it became the Society of Engineers in 1857. In 1910 it was amalgamated with the Civil and Mechanical Engineers' Society, which had been formed in 1859, and since then it has been known as the Society of Engineers (Incorporated). It is the third oldest engineering society in Britain. The president-elect for the centenary year is Mr. W. R. Howard, an authority on ferro-concrete engineering, who has received three French awards for his work in the international field. He has been a member of the society since 1917, a Fellow since 1946, and hon. treasurer since 1947.

A centenary committee is organizing a comprehensive programme of events to mark the society's first 100 years. The celebrations will open on May 4 with a conversazione at the Science Museum, South Kensington. On May 5, a business session will be devoted to the presentation of papers dealing with 100 years' progress of civil, mechanical, electrical, and aeronautical engineering. This will be at the Geological Society's apartments at Burlington House, Piccadilly. On May 6 there will be a day trip on the River Thames to visit the works of the Lafarge Aluminous Cement Company, Limited, at West Thurrock (Essex). The climax to the celebrations will be the centenary banquet in the Fishmongers' Hall. Scottish members will hold their own centenary celebrations on May 15.

Steelfounders' Pledge

An undertaking that the British steel castings industry will "go to the limit" to help its customers to meet the threat of foreign competition was given by Mr. F. N. Lloyd, the vice-chairman, at the biennial dinner of the British Steel Founders' Association, at Claridges, last Wednesday week. He said that British steel castings competed in price with those of any other country in the world, except Germany, in the case of which some thought the competition was unfair, although he was told on equally good authority that this was not so. The industry was out to help its customers to meet foreign competition in every way it could. It could do more to help than possibly is imagined.

Fifteen per cent. more wages could easily be given if there was a corresponding increase in work. There was an easy 30 per cent. to be got in most factories in the country by the right kind of co-operation between labour and management.

Mr. Lloyd was responding to the toast of "The Association," proposed by Mr. Walter Elliot, M.P., who had described the industry as "one of the most skilled of all the offspring of the Industrial Revolution." He said that its production last year of some of the most highly developed metal products the world had ever seen had represented a turnover of £25 millions.

Dinner

BEESTON BOILER COMPANY, LIMITED

Mr. Mark Pearson presided when the Company entertained members of the Beeston Boiler Foremen's Association at Hand's Café, Beeston. Amongst those present were Mr. A. Allison; Mr. F. Shipley; Mr. G. Foxall; Mr. W. F. Cookson; Mr. E. J. Searle; and Mr. R. Stafford.

Scrap Price Offence

Hill Top Foundry, Limited, Wednesbury, were fined £4 with 3 guineas costs when they pleaded guilty at West London court last month to seven summonses under the Iron and Steel Scrap Order. The magistrate, Mr. E. R. Guest, said that he would deal with the prosecution as an absolutely technical matter and commented: "Apparently if you sell cast-iron scrap and don't deliver it to your customer, you can charge more than if you do deliver it." He referred to the prosecution by the Ministry of Supply as "a complete mystery." The charge alleged that the firm had bought heavy machinery cast-iron scrap from A. E. Sadler & Sons, Limited, of London, at prices totalling £943 which exceeded the permitted maximum by £202 18s. 10d. For the Ministry, Mr. N. D. Knowles said the price of scrap at the yard was 145s. 11d. per ton, but if it were sent, the cost of cartage had to be deducted. Answering a question by the magistrate on this point, Mr. Knowles said that the intention was to discourage the movement of scrap steel outside various areas. It was asserted that the company chose to purchase scrap in London at a price which was less than the maximum but the defendants paid for all freightage and the result was that the controlled price should have been a great deal less.

For Hill Top Foundry, which has been a family concern for 199 years, it was stated that they had no longer been in a position to purchase scrap from a Staffordshire supplier. They had no alternative but to buy from London to keep their foundry open. The magistrate commented that they had acted in the best interests of the firm and its workers. It had proved impossible to move the scrap by the defendant's own transport.

The illustration shows the Salter 200-ton capacity crane weigher (believed to be the largest in the world) undergoing load tests up to 300 tons at Lloyd's Proving House, Netherton. As earlier reported, the instrument, which itself weighs more than 6 tons, has been made specially for the English Steel Corporation, of Sheffield.

Application of Shell Moulding to Steel Castings

*By C. Hand, A.Met., A.I.M., and P. R. Beeley, B.Met., Ph.D., A.I.M.**

Although a considerable volume of literature dealing with the mechanics and methods of shell-moulding has been published, relatively little has been heard from the actual producers of castings concerning their experience of the process and their views and observations on its capabilities. These remarks apply to shell moulding in general, but more especially to the field occupied by the shell moulding of steel castings.

The Sheepbridge organization has now been in the shell-moulding field of activity for a period of approximately two years, during which time there has been a steady increase in the scope and variety of components which have been successfully produced at the foundry of Sheepbridge Steel Castings, Limited, Sutton-in-Ashfield. The original reason for entering this field was the necessity for producing one particular design of casting which had proved to be extremely difficult to make by conventional methods, and on which repetition production quantities had been obtained only at the expense of high scrap percentages. Experiments with the shell-moulding process on this particular casting, which is illustrated in the centre of Fig. 1, showed that remarkable improvements could be achieved with respect to surface finish, perfection of detail, and freedom from porosity and inclusions. This success gave rise to further developments in other directions until the present time, when a large and steady increasing stream of components is being produced by this method of manufacture.

* The Authors are on the staff of Sheepbridge Steel Castings Limited.

Propaganda Needed

With the successful opening up of this field of activity, and the quantity production of a new type of product, matters have reached a stage where the principal need is for the potential user of such castings to be provided with a clear indication of the possibilities and limitations of the process, with particular reference to design factors, surface quality, and dimensional accuracy of the finished product. Although the general principles of design are the same for shell-moulded as for conventional steel castings, it is possible, for instance, by virtue of the relatively high permeability of the shell mould, to incorporate much thinner sections than with normal methods of castings. The casting shown in Fig. 1, for example, has a general thickness of $\frac{1}{8}$ to $\frac{3}{16}$ in., the fins tapering from $\frac{1}{8}$ in. at the roots to $\frac{1}{16}$ in. at the tips, over their depth of $\frac{1}{2}$ in. Similarly, the hindrances to contraction offered by the mould being of a much lower order than those of conventional sand moulds, the incidence of hot-tearing is correspondingly reduced, although this defect may, of course, still occur due to other factors.

On particular types of steel castings, shell moulding may permit the reduction or elimination of

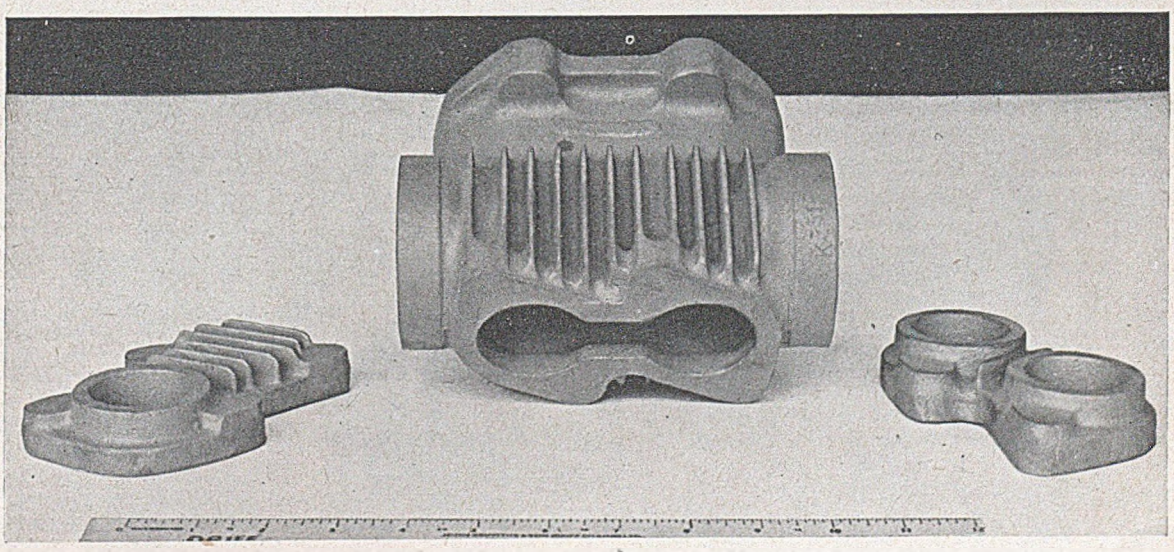


FIG. 1.—*Group of Shell-moulded Austenite Steel Castings. Note the Good Surface Finish.*

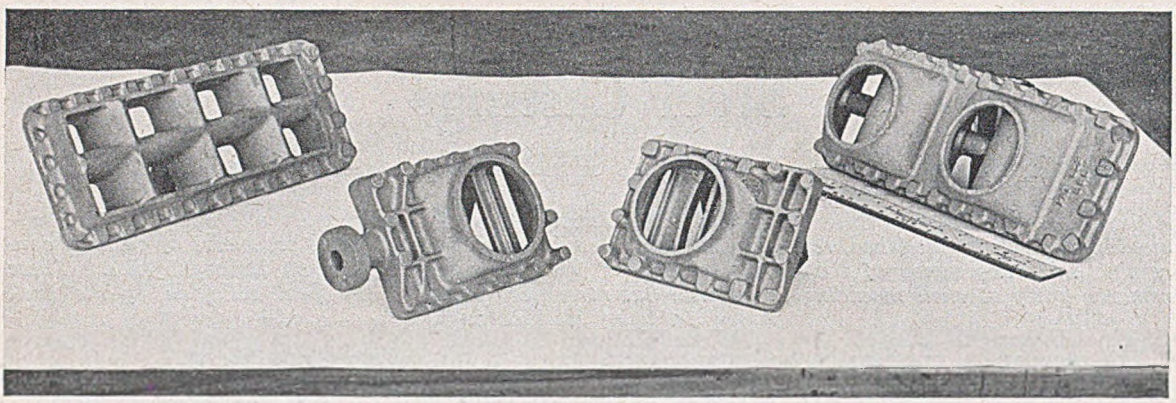


FIG. 2.—*Shell-moulded Steel Castings incorporating Thin Sections and Fine Detail.*

feeding problems associated with certain design features. The removal of the excessive machining allowance needed for castings produced by ordinary foundry methods may reduce the thickness of sections which are difficult of access for feeding to an extent which will result in a completely sound casting without special feeding arrangements. The surface quality of the shell-moulded steel casting offers a very distinct improvement over that usually obtainable from ordinary castings, and the castings are particularly notable for their sharpness of contour and perfection of detail, normally only associated with castings in the alloys of lower melting point.

It has in fact become possible, in the light of these factors, to produce many types of casting which would be altogether unsuitable for normal methods of production, unless they were radically modified—the latter frequently at the cost of prolonged and involved machining operations subsequent to casting. Such castings, as illustrated in Fig. 2, carry a considerable amount of fine detail and have extensive areas which are made up of very thin sections. The main body of each casting is only $\frac{3}{16}$ in. thick.

Although values for the dimensional tolerances which are capable of being achieved by the shell-moulding process have been quite extensively quoted in the literature, it is considered inadvisable to stipulate numerical values for these tolerances on a general basis, as so much depends upon the design and dimensions of a particular casting, and upon the build-up of the mould itself. The process is undoubtedly capable of very high degrees of

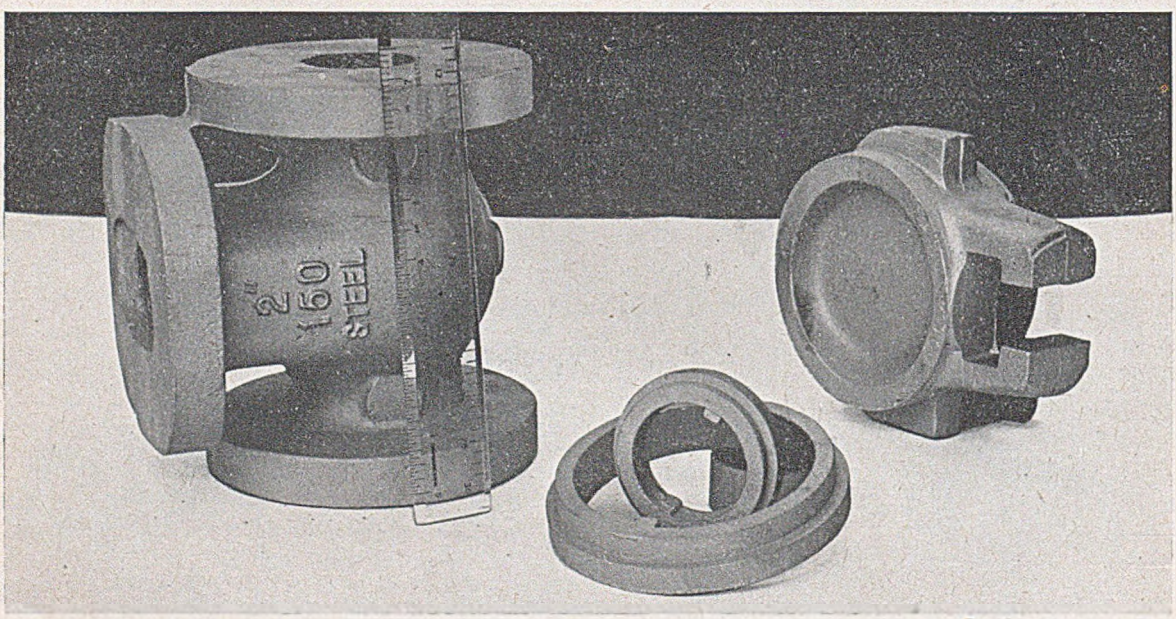


FIG. 3.—*Valve Castings, comprising a Plain-carbon-steel Body and* 13 *per cent. Chromium-steel Wedge and Seatings, all made in Shell Moulds.*

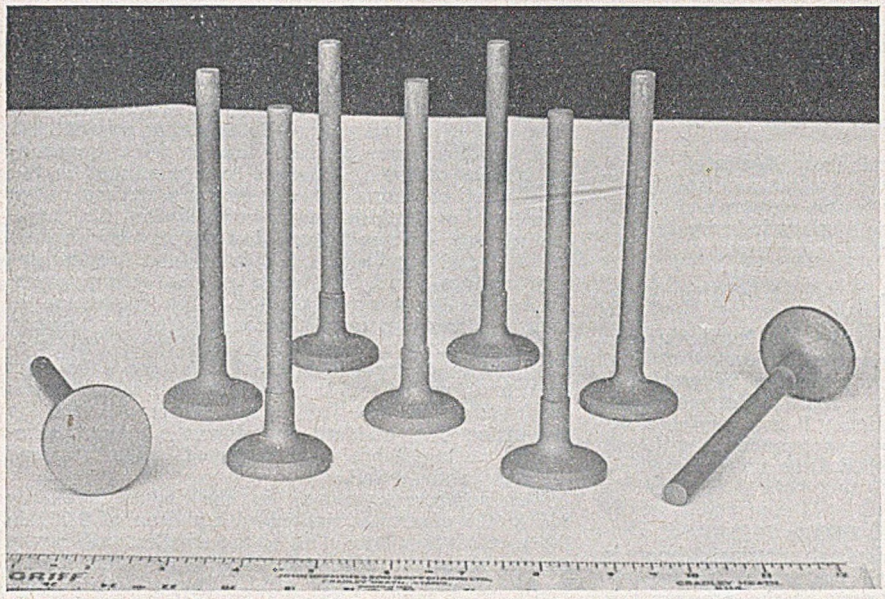


FIG. 4.—*Shell-moulded Heat-resisting-steel Automobile Valve Castings.*

reproducibility of certain dimensions, particularly those which are controlled by a single element of the pattern equipment. In more complex designs, however, many dimensions are dependent upon the mutual alignment of the various components of the mould, and accuracy is therefore reduced. In general terms, the present Authors would agree with the remarks of B. N. Ames in the American exchange paper to this year's annual conference of the Institute of British Foundrymen.*

A factor which is very closely associated with dimensional accuracy, and which is frequently ignored when numerical claims are being made, is the accuracy with which the mode and degree of contraction can be predicted with varying designs. This, and not the moulding process, is the fundamental limitation to the attainment of very high degrees of accuracy. Considering, for example, a hypothetical casting dimension of 5 in., and allowing 2 per cent. contraction, a total contraction of 0.100 in. may be expected to occur. Since contraction is dependent on several factors, such as shape, thickness, etc., an error of 5 to 10 per cent. in this prediction is quite possible, and would lead to a difference of 0.005 to 0.010 in.; on very tight limits this could of course be too great a variation.

To achieve very narrow limits of accuracy on a given component, therefore, there is no doubt that experience is required of the production of that component over a period, and it would seem that the most satisfactory procedure in most cases is to commence with pattern equipment which allows a margin of safety, the finishing allowances being reduced to a minimum only after a run of castings has been dimensionally checked and found to carry sufficient metal for the proposed reduction. In this respect, therefore, long production runs on a particular casting offer a distinct advantage over small quantities.

* "Survey of the Shell-moulding Method of Casting Production," JOURNAL, July 2, 9 and 16, 1953

Casting Low-carbon Steels

It has been extensively suggested that some fundamental difficulty exists to prevent the successful production of carbon and low-alloy steels by the shell-moulding process, although of course the austenitic stainless steels have been in steady production and demand for some considerable time. The existence of difficulties was confirmed in some of the early work on carbon and low-alloy steels at the Sutton foundry, but the results of a considerable amount of experimental work since that time have shown that, by the use of the correct techniques for these materials, castings can be produced which are the equal of those in higher-alloy steels in every respect. Large production orders for carbon and low-alloy steel castings have already been executed, and castings weighing up to 60 lb. in carbon steel are now in regular production. There is no reason to suppose that the weight limit lies at this level, and plans are being made to continue with still heavier castings in these materials. Fig. 3 illustrates a set of wedge valve castings, consisting of a mild-steel body and 13 per cent. Cr steel seatings and wedge.

An entirely new venture for this country has been the production of cast valves for the automobile industry. These are produced both as complete valves in austenitic steel (see Fig. 4), and with cast austenitic-steel heads having welded-on stems of 0.5 per cent. carbon steel. These valves compare very favourably with their forged counterparts, and are likely to prove considerably cheaper.

It is, therefore, apparent that shell-moulded castings in all types of steel will very rapidly come to the forefront for a large range of applications. These applications lie partly in the field at present occupied by conventional steel castings, but where a high degree of accuracy and surface finish are particularly important. The closeness with which the finished dimensions may be approached will obviously be attractive to designers and users for a large number of components where it is desired to reduce machining to a minimum, and where, in many cases, parts are being cut from solid metal or from forgings which carry a large amount of machining.

The degree of accuracy of shell-moulded castings is not as high as that of the lost-wax or invest-

(*Continued on page* 759)

Publications Received

Steel Castings in Electrical Power Plant and Equipment. Issued by the British Steel Foundries' Association, Broomgrove Lodge, Broomgrove Road, Sheffield, 10.

This very well written and finely illustrated booklet stresses the need for the greater availability of electrical power for industry in this country and shows how the resources of the steelfoundry industry can be harnessed for the attainment of this object.

Engineering in Hiduminium. Issued by High Duty Alloys, Limited, Slough, Bucks.

The publishers of this very interesting brochure have produced a documentary film with the object of teaching designers just what are the properties of cast and wrought aluminium alloys and the booklet picks out and illustrates the salient points. It is a very sensible idea to reinforce memory by a permanent record and one worth emulating by other firms using films for business purposes.

Stewarts and Lloyds, Limited, 1903 to 1953

The major interest of this finely produced book is the manner in which a half century of history has been interwoven with the story of the progress this great industrial enterprise has made. The choice of event and picture has been such that people of all ages recall the emotions engendered at the time. No aspect has been neglected whether it be the family "trees" of the founders of the company, Royal appearances, sporting events, wars and national crises, to sensational murders. The period covering as it does two world wars puts into relief the essential rôle played by such large units of industry as Stewarts and Lloyds. Very wisely, full use has been made of maps, for but few pictorial representations receive closer study. The dust jacket of this book warrants no other adjective than "excellent." The art of the old cartographer has been improved upon and modernized—it even includes the "Kontiki" and coelacanth. In congratulating the publicity department on the real merit of this production, one can only comment that recipients of this book were indeed born under a lucky star.

Safety Conference. The Council of Ironfoundry Association's new Safety Committee is organizing a conference on this subject to be held at Ashorne Hill from March 1 to 3, 1954.

Gas and Electric Furnaces. Birlec Limited, Erdington, Birmingham have issued four pamphlets respectively dealing with electric-furnace brazing; shaker-hearth-conveyor gas furnaces; gas-carbonizing, and arc furnaces. It is the last one which is of major interest for readers. This is impressively illustrated and attractively presented. The method has been to deal, in order, with the melting of steel, cast iron, nickel, and copper, and complete the whole by paragraphs on special processes and laboratory plant. The claims for the use of the electric furnace for the melting of cast iron are well founded except, perhaps, without more qualification of the statement "avoids loss of alloys by oxidation." The cupola is normally a reducing plant. The second part enters very thoroughly into the actual construction of furnaces. The change of capacities available is now about two dozen as against about four ill-defined ones at the end of the 1914-18 war. Since this time, the maximum capacity has grown from 15 tons to 115 tons. It is a very acceptable brochure and is available to readers on writing to Erdington.

Ironfoundry Production

The *General Bulletin* of the Council of Ironfoundry Associations makes the following comments on the statistical position of the industry as revealed for the third quarter of this year:—Total output was 826,896 tons, which is 3 per cent. less than in the corresponding quarter of 1952. Changes have continued in the distribution of output between the main sections of the industry. For the fifth quarter in succession, the "engineering and jobbing" share has fallen. Within this section of the industry, agricultural and food-machinery castings fared best, while marine castings were among the items worst affected. The proportion of total iron castings output accounted for by "pipes" fell slightly, for the first time since 1951. By contrast, the other main item which has been showing a consistent upward trend, namely, "ingot moulds," has continued to increase its share. The recovery in the proportion of "building and domestic" and "automobile castings" has also continued, while "railway castings" show a fall.

The numbers employed in the industry fell by 805 in the quarter compared with a drop of 3,702 in the previous quarter. This is the smallest fall in any quarter since the decline in the labour force started in the second quarter of 1952. Unemployment continued to fall, from 2.1 per cent. of the labour force in July to 1.7 per cent. in October.

According to the November *Statistical Bulletin* of the Iron and Steel Federation there was a reduction in employment in iron foundries on October 10 of 498 as against September 5, the total at the former date being 140,301. A year earlier it was 152,743. The steel foundries, however, showed increased employment. In October their labour force totalled 20,555, an increase of 89 over September and 79 over October of last year. During October, the average weekly quantity of liquid steel made for the production of castings was 11,400 tons. In September it was 11,300 and in October, 1952, 11,700.

Tube Makers' Slide Rule

The department of development and research of Tube Investments Limited has brought out a special slide rule for use in tube makers' and deep drawing calculations, as well as a booklet describing its formulation, method of use and applicability. From the latter, which runs to 30 or more pages, it is learnt that calculations are possible relating to:—Actual weights of finished tubes; weights of starting material; losses incurred during processing (six examples are cited); hot- and cold-process planning; continuous annealing; physical and chemical coatings; material testing and electroplating. From this list, 20 examples of working the rule are quoted in detail. The rule also includes, of course, some of the scales normally to be associated with ordinary slide rules. Although conversion values of weight per unit volume as related to mild steel are quoted for as many as 18 different metals, it seems a pity that neither cast irons nor bronzes are amongst them. However, doubtless founders wishing to use the rule for calculations concerning iron pipe or metal "stick" castings would have such ratios to hand. Readers who are interested in acquiring information as to availability should write to Mr. T. J. Lovell, of the T.I. Group's Information Service at the Adelphi, London, W.C.2.

ABOUT 470 PEOPLE attended the annual dance of the Sheepbridge Engineering Works Sports Club, which was held in the works canteen.

Experiences in the Exothermic Feeding of Grey-iron Castings*

By J. Grice

During recent years, tremendous strides have been taken in foundry technology and practice, probably more than ever before. These developments have fundamentally affected the foundry at shop-floor level, that is, they have not been abstruse metallurgical problems worked out in the laboratory, but steps which have caused the foundryman to take considerable note of the natural forces that are at work, when, for example, liquid metal is poured into a mould. Much has been written in the technical Press and much spoken at the various branch meetings of the Institute concerning these natural forces and it is in this context that it is felt the Author may be reiterating the obvious to many. Nevertheless, it is necessary to restate basic principles to maintain the full force of the results obtained from work described.

Methods of Running Castings

Progressive solidification should be the aim of all foundrymen when deciding how to feed a casting and in designing the type of feeder to use. This progressive solidification means that liquid metal in a mould should freeze from the bottom to the top, which indicates that in deciding on the method of running a job, the hottest metal should be in the feeders after the mould is poured. To get this desired effect the inference from this is, that all castings should be poured from the top. This, of course, cannot apply in very many castings. Many of the examples in this Paper are jobs that are bottom run. Why must jobs be bottom run? Three main reasons come to mind right away; the first is that with a large casting metal has a long way to drop when being top run, giving the danger of sand pick-up, and secondly, top running gives extreme turbulence of metal. The third reason is that, with bottom running, dross traps can be inserted in the runner. Whilst on the subject of running systems it is worth while mentioning the pouring basin. These should be well rammed and clean, the down-runner should be well defined and so cut that the stoppers will not allow metal to seep into the mould. Only when the pouring basin is full and the stoppers lifted should metal enter the mould.

With one set of examples, that in the group "hydraulic cylinders," it will be observed for the above two reasons this type of job must be bottom run, but with the second set of examples, those of diesel-engine flywheels, these are top run, due to the fact that the metal drop is small and there are no cores to be disturbed by metal turbulence. Thus it will be clearly seen that the ideal of hottest metal in the top and coldest metal in the bottom, very often cannot occur; in fact the very opposite happens, that of coldest metal in the feeders and hottest metal at the bottom of the mould. Naturally, in a

* Paper read before the Birmingham branch of the Institute of British Foundrymen, Mr. T. H. Taft presiding.

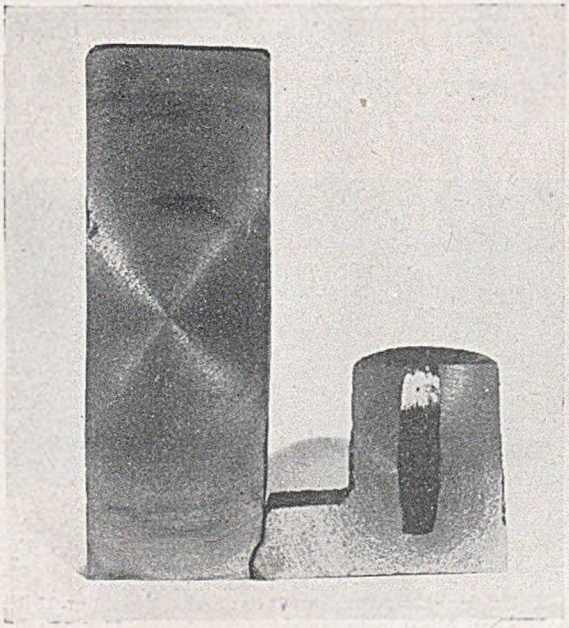
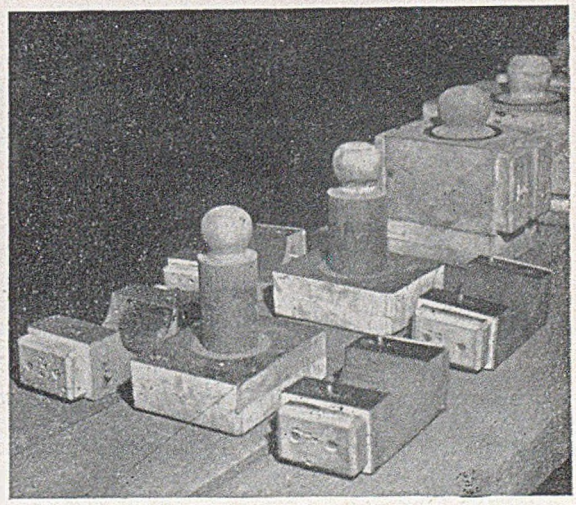


FIG. 1 (*left*).—*Test Block, fed entirely by Atmospheric Pressure.*

FIG. 2 (*below*).—*Group of Coreboxes for making Exothermic Sleeves.*



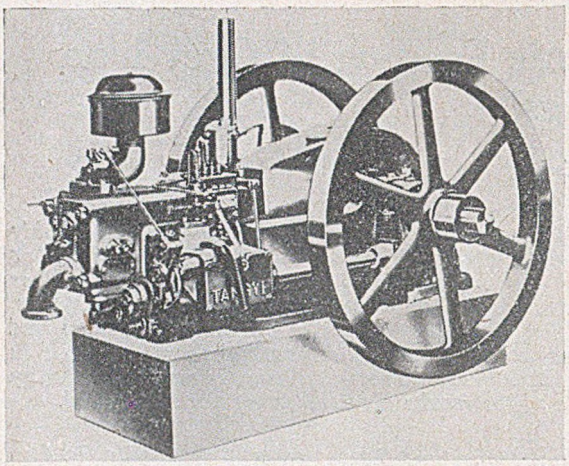


FIG. 3.—*Single-cylinder Horizontal Diesel Engine of 15 h.p.*

very large mould, whether top or bottom run, owing to the large mass of liquid metal there will eventually tend to be, an even distribution of heat due to convection.

Atmospheric Pressure and the Force of Gravity

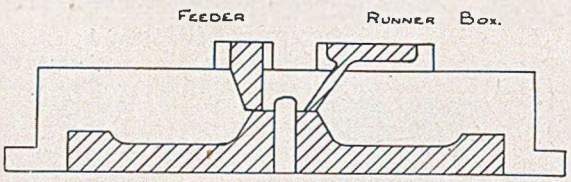
Having got the liquid metal in the mould, it is worth while to study for a few minutes what is happening. There are two natural forces at work to help the foundryman in his efforts to make sound castings. In the first place, there is atmospheric pressure at 14 lb. per sq. in., and secondly, the force of gravity, or alternatively, the actual weight of the liquid metal bearing down upon itself. It is important to point out here that atmospheric pressure does not exert its influence on the open liquid feeder until there is a thin shell of solid metal surrounding the whole face of the casting. Then again as soon as the top of the feeder is frozen over the effect of atmospheric pressure is lost, thus it will be observed that these two natural forces do not cease to function at the same time, but depend upon certain prevailing conditions to allow them to keep at work. As has already been said, as soon as the top of the feeder freezes over and seals off the inside of the casting the effect of atmospheric pressure is lost completely and, let it be clearly understood, the loss of this pressure is very serious take, for example, a small feeder of 4 in. dia., the pressure exerted here when the metal is in the liquid state is 175.8 lb. In Fig. 1 is shown a test block which demonstrates to the full the importance of atmospheric pressure. It is a block 12 in. by 4 in. by 3 in. with a side feeder 3½ in. dia. by 5 in. into which is placed an atmospheric core. The only means of feed for this casting is through the neck joining the casting and atmospheric feeder. This casting on being cut in half shows no shrinkage at all, in fact it is a perfectly sound casting. To obtain this, the indications are that feed has been entirely by atmospheric pressure after a shell of solid metal has formed round the outside of the casting.

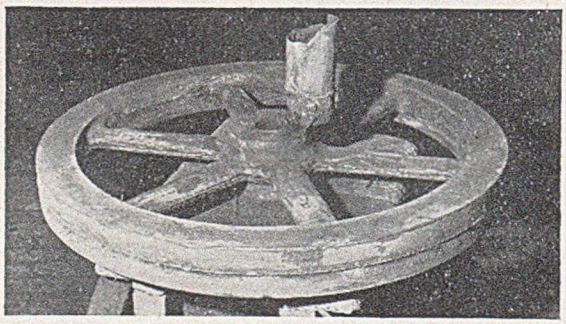
A characteristic of this pressure can be noticed on a feeder of fairly large area. When cold, the surface metal is curiously buckled. However, once the inside of the casting is sealed off, there still is the effect of gravity which comes to bear with ever decreasing power as solidification takes place. It has been appreciated for years the importance of keeping feeders in the liquid state and foundrymen all know what rod feeding is with all its laborious pumping under extremely trying conditions. On the whole, however, it is felt that it is little appreciated how short the time is, between the pouring of a mould and the time taken for the casting and feeder to be surrounded by a shell of solid metal, thus giving rise to a consequent loss of atmospheric pressure.

Exothermic Feeding Compounds

Now comes the question—how can exotherimc compounds help in the successful feeding of a casting? First, a short description of what the compound is, and of its application. It is a powder which will mix with water, not too readily as it happens. If mixed by hand quite a considerable amount of stirring must take place before the mixing is complete. Once thoroughly mixed, however, the compound is mouldable and has quite a good green strength, sleeves with a wall as thin as ¼ in. standing 6 in. high have been made quite successfully from a corebox. Actually it can be made into any desired shape, but the most useful and the one upon which methods in this paper are confined is the sleeve which is inserted into and made to line the feeding head.

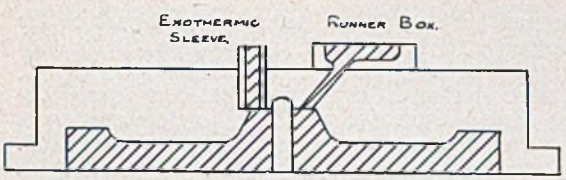
Fig. 2 gives a general view of coreboxes and also the method of corebox construction. It consists of a base in which is inserted a loose peg to give

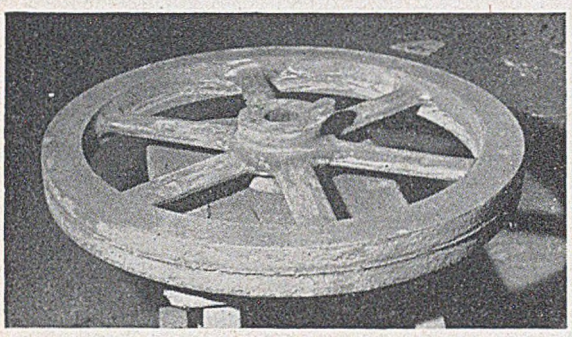




FIGS 4 *and* 5.—*Method Sketch and Casting, showing Former Method of Running and Feeding the Flywheel.*

Total weight, 5 cwt. 3 qr. 18 lb.: feeder, 1 cwt. 1 qr. 18 lb.; yield, 76 per cent.





FIGS. 6 *and* 7.—*Method Sketch and Casting of Same Design as Fig.* 5, *but using Exothermic Sleeve.*

Total weight, 4 cwt., 2 qr. 22 lb.; feeder, 22 lb.; yield, 95.8 per cent.

the inside size, and then two suitably dowelled outside sections to make the outside diameter. The boxes range in size from 2½ in. inside diamter with a wall thickness of ½ in. to an inside diameter of 9 in. with a wall thickness of 1½ in. A corebox made along the lines described enables a sleeve to be extracted with the minimum amount of disturbance. Dependent upon the method adopted for insertion of the sleeve in the feeder head, will rest the decision whether or not a thin sand base is rammed up first in the bottom of the corebox before the exothermic material is rammed up. It is important that the material itself does not come into contact with the casting face, therefore, the sleeve can have a thin oil sand base or, alternatively, a ledge of sand can be made in the top part of the mould upon which the sleeve can rest.

Both methods have been used and it rather depends on the actual job which way is adopted. Naturally enough, the sleeve needs to be as near the casting as possible, therefore, the sand base or the ledge of sand does not want to be more than ¼ to ¾ in thick. Before removal from the corebox, the sleeves need to be well vented with a vent wire. Gas evolution from the sleeve on ignition is not excessive but care must be taken to see that it exhausts to atmosphere and not into the liquid metal and, of course, air must be available for combustion. For drying, the heat in the drying stove need not be too high, about 65 deg. C., one has been put through a continuous core stove running at 175 deg. C. and it has fired off, but on the other hand a dried sleeve when rammed up in the top part of the mould, that is to say completely surrounded by sand and then put into a mould drying stove to dry the mould, at a temperature of 150 to 175 deg. C., the sleeve has not fired off. The sleeves when dry are quite strong and will stand quite rough handling and as just stated will not break when being rammed up in a mould. The standard depth used is 6 in. and it is quite simple to build up to greater sized feeder if necessary.

As metal is poured into the mould and as the level rises into the feeders, the sleeve is ignited by the heat of the metal. The exothermic reaction then sets in and produces temperatures up to 2,000 deg. C. Most of this heat is transmitted to the metal and an actual increase in metal temperature can take place, thus the premature solidification of the feeder is prevented. Even after burning, which takes some two or three minutes, dependent, of course, on the thickness of the sleeve, the burnt out material acts as an insulator preventing heat loss. Its insulating properties are approximately three times those of moulding sand. There is another application of these compounds and that is in powder form which is sprinkled on the top of the feeder head. In all cases of application that will be described the powder is used in conjunction with the sleeve and is applied fairly liberally after the feeder is full of metal.

Diesel-engine Flywheels

After this introduction it is now possible to turn to some experiences with the use of exothermic feeding compounds in the feeding of castings, and, it is important to state at this outset, that the reason they were first used

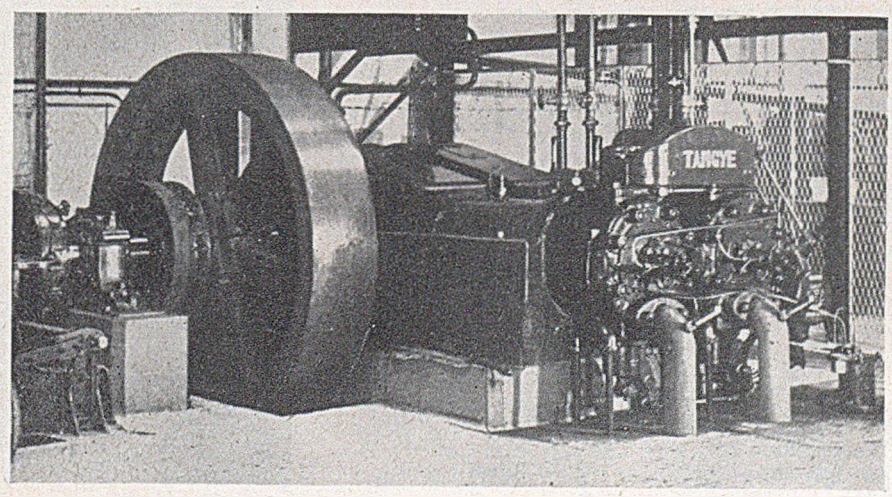


FIG. 8.—*Twin Horizontal Diesel Engine of* 180 *h.p. having a* 6-*ton Flywheel.*

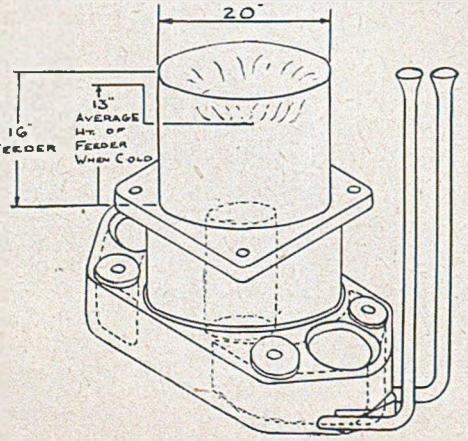
was from the point of view of making sound castings. The economic aspect came later and was quite incidental. It was decided to make a start with a fairly light range of castings, although there were large quantities off. These castings are flywheels for a range of Diesel engines. Shown in Fig. 3 is a photograph of a single-cylinder horizontal Diesel engine showing these flywheels. There are five sizes of this type of engine, varying from 15 h.p. to 27 h.p. The flywheels weigh 4½ cwt. each for the smallest size of engine, to 8½ cwt. for the largest. The trouble experienced in the foundry was porosity under the feeder head and extensive areas of porosity revealed on machining the bore.

Figs. 4 and 5 show the former method of feeding one of these flywheels and the residual feeder after pouring, the yield of good casting to feeder and runners being 76.0 per cent. These castings are green sand cast and are made by impeller ramming from a half pattern mounted on a cast iron pattern plate. The composition of the iron is TC.3.35; Si 1.98; Mn 0.70; P 0.53; S 0.116 making 16 tons per sq. in. tensile strength. The size of the boss which was to be fed was 8in. dia. with a 2¾ in. core running through and it was 6 in. deep. At this stage no basic information of the type of sleeve to use was available; therefore a start was made with a size which could conveniently sit on the side of the boss. The size of sleeve used was 2½ in. inside diameter with ½ in. wall thickness and the total height 9 in. that is, a standard 6 in. sleeve with one cut in half to make up the 9 in., and, in sleeves put on this type of casting all have a sand base. The positioning of the sleeve was quite simple, as shown at Fig. 6, the sand base was placed directly on the boss surface, a sprinkling of sand placed round and gently hand rammed to hold in position and then the whole impeller rammed making the sleeve an integral part of the top part of the mould. The runner was maintained as previously.

Observations taken on these castings after pouring proved extremely revealing. A close study was taken on the reaction of metal in the feeder head. For two minutes after pouring the firing off of the sleeve took place and for another 90 seconds the level of the metal remained quite still. Incidentally, for these initial tests no exothermal powder was put on the feeding head. After this total lapse of time of 3½ minutes, the level of liquid metal began to fall quite perceptably for a depth of 4 in. This took about 3½ min. to occur, thus about 4 to 5 lb. of metal had been absorbed. The drop of the level of the metal then ceased as far as observations with the naked eye were concerned and at this stage exothermic powder was sprinkled on, and naturally enough observations from then on were rather difficult but it is possible to say that 20 min. after pouring the level had continued to fall and that the metal was still in the liquid state. Fig. 7 shows the residual metal left on the flywheel boss after use of an exothermic sleeve. It will be noted that after taking the runner into consideration the yield has increased to 96 per cent. A batch of these castings was made and on machining were found to be completely free from previous defects. The question will naturally be asked did the use of the sleeves completely clear up the trouble? In point of fact this defect was completely cleared.

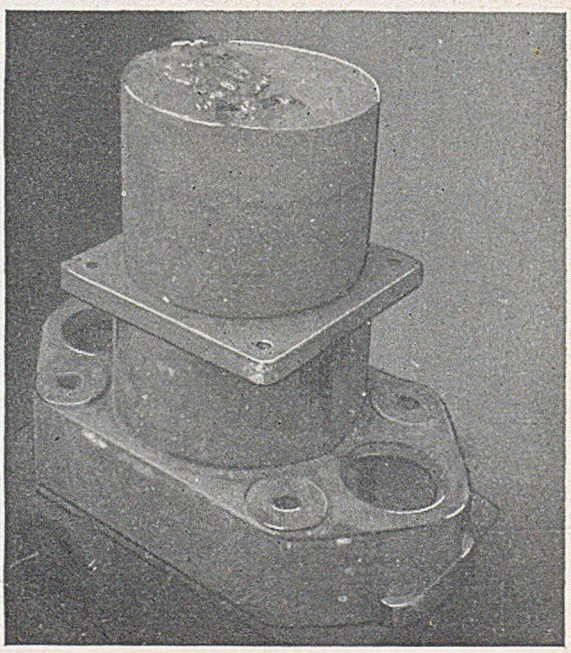
FIG. 9.—*Sketch showing Original Method of Running and Feeding the Hydraulic Cylinder; and* FIG. 10, *Finished Casting with Feeder attached.*

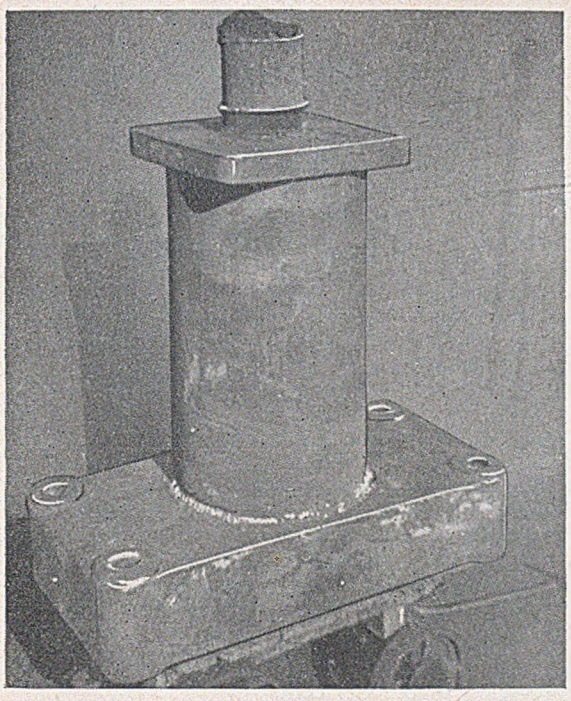
Total weight, 1 ton 13 cwt. 2 qr. 4 lb.; feeder, 10 cwt.; yield, 69 per cent.



Range Handled

From the foundry method point of view, flywheels for Diesel engines made by Tangyes, Limited, can be divided into two main groups. There are those weighing from 4½ to 18 cwt. in this group are those already described, which are green sand





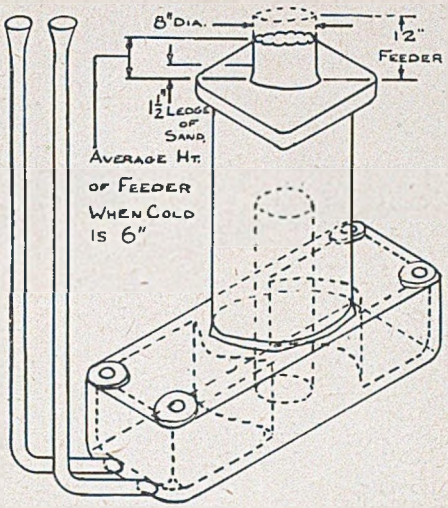


FIG. 11.—*Exothermic Feeding Method applied to a Hydraulic Cylinder; and* FIG. 12, *the Casting with Feeder Head attached.*

Sleeve size, 8 in. i.d. by 12 in.; painted with telurium paint; total weight, 1 ton 9 cwt. 1 qr. 8 lb.; feeder, 1 cwt.; yield, 96 per cent.

cast and fed on the boss, and a second group from 24 cwt. to 6 tons which are dry sand cast, in fact on the very large sizes, the bottom, rim and top are struck up in loam with the arms made from dry-sand cores, run on the rim with four feeders on the rim and two feeders on the boss and at Fig. 8 is shown a 6-ton flywheel on a 180 h.p. twin horizontal Diesel engine.

On these wheels also, porosity and even holes under the feeders have been experienced, especially on the boss. These faults were, however, overcome by rod feeding and then when exothermic feeding compound came along, these were used. Of necessity, the description about this type of flywheel must be brief. Of the one under consideration the rim was 12 in. deep with 9½ in. face, four feeders 8½ in. dia. by 12 in. deep being used, and for the boss was 13 in. dia. with a 4½ in. dia. core and 18 in. deep. The feeder here being slightly smaller, 7½ in. dia. by 12 in. deep. Incidentally to rod-feed this wheel, which was 3 tons 3 cwt. in weight, took 4½ man hours. The exothermic sleeves, which took the place of the feeders, were 4½ in. inside diameter with walls 1 in. thick and two 6 in. lengths were placed on top of one another. Here for the first time topping up must be mentioned. For 30 min. the sleeves were topped up to take care of liquid shrinkage. By the former method, feeders knocked off from the casting weighed 9 cwt. 0 qr. 24 lb., whilst feeders from exothermic feeeding weighed 4 cwt. 2 qr. 24 lb. the composition of these large flywheels was TC 3.32; Si 1.91; Mn 0.69; S 0.125; P 0.64, giving 16.2 tons per sq. in. On machining, the defects were completely cleared, thus the yield had been improved from 88 to 93 per cent. and rod feeding completely eliminated.

Hydraulic Cylinders

From flywheels, attention was turned to another group of castings, these are high-duty castings and come under the heading of cylinders for general hydraulic machinery. These cylinders are the main component for hydraulic presses and tube-testing machines. As will be well appreciated only sound castings will be accepted for this kind of work. Not only must the bore be absolutely free from any defect after machining, but there must be no leaking under pressure. These pressures range from 1 ton to 1½ tons per sq. in. If a casting be scrapped due to leaking, not only is there the loss of this casting cost, but the excessive machining costs are wasted. Figs. 9 and 10 show a picture and methods sketch of a hydraulic cylinder of the type described, with the type of feeder used previously. The casting weighs 23½ cwt. and the size of the feeder is 20 in., that is the full diameter of the cylinder section of the casting, the height of the feeder being 16 in. On being weighed after parting off, the feeder weighed 10 cwt.

For purposes of comparison between this cylinder just illustrated, it will be realized that this type of job is in the "one off" category and, therefore, it has been necessary to use a casting of the same type for the second illustration. Figs. 11 and 12 illustrate the feeder and methods sketch of this casting, it is larger in the cylinder section than the previous one and is heavier in weight (28¼ cwt.). The sleeve used on this cylinder had an inside diameter of 8 in. with a wall thickness of 1½ in., with a total height of 12 in (two 6 in. sleeves on top of one another). In the moulding of the top part,

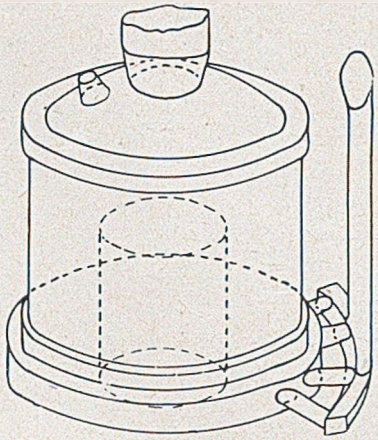


FIG. 13.—*Sketch showing Running and Feeding Method for a Cylinder, using an Exothermic Sleeve; and* FIG. 14, *the Casting before removal of the Head.*

Feeder, 12 in. high as poured and 7 in. high when solid, diameter 9 in.; 3 in. of "piping." Total weight, 1 ton 4 cwt. 0 qr. 6 lb.; feeder, 1 cwt.; yield, 95.5 per cent.

in this particular case a ledge of sand was made ½ in. thick, upon which the sleeves rested, thus these sleeves had no sand base incorporated.

Immediately after pouring the casting, a fairly liberal layer of exothermic powder was sprinkled on the top of the metal in the feeder. First came the exothermic reaction, lasting some minutes. The level of the metal began to fall about two minutes afterwards and was then so rapid that within eight minutes the first topping up took place—35 lb. of metal being poured in. This initial rapid drop is symptomatic of the use of exothermic feeding compounds. At this stage there was a perceptable slowing down in the rate of metal absorption, but, nevertheless it was still at a steady rate, after another 12 min. 30 lb. of metal was poured in, and after another 15 min. a final 20 lb. of metal was added, a total of 40 min. after pouring. The metal in the feeder was liquid an hour and fifteen minutes after pouring, no more observations being taken after that time.

Yield

On knocking out, it was noted that after final topping up, feeding had continued to the extent of reducing the feeder from 12 in.—its original height—to 6 in., the weight of the residual feeder being 1 cwt. Taking the weight of metal in the feeder on the last topping up as 151 lb., this indicates that another 39 lb. of metal was fed into the casting before final solidification. In total, therefore, 124 lb. of metal was fed in the casting, a metal absorption of 3.9 per cent.

To confirm effectiveness of this experiment, close observation was made on another cylinder of the same type, the weight of the casting in this case being 19 cwt. After pouring, the process of feeding went on as before, after 10 min. 30 lb. was put in to top up. The top of the metal was well covered with the compound in powder form and then left without interference. However, observations were made and one hour after pouring the metal was still liquid in the feeder. On weighing the feeder after it was removed from the casting, it scaled 140 lb., indicating that after the final topping up, 40 lb. of metal was fed into the casting, making a total of 95 lb. in all, giving a metal absorption rate of 4.5 per cent. The composition of the iron for this cylinder was TC 3.20; So 1.3; Mn 0.64; P 0.43; S 0.116 and the castings proved sound after machining and hydraulic test.

It was important at this stage to examine the economics of the use of exothermic feeding compounds. This was done, but for the sake of this Paper, it is left until a little later on. In Figs. 13 and 14 are shown another example of a cylinder using an exothermic sleeve, illustrating the casting and method card.

Second Example

At this point it is desirable to give for examination the description of a series of methods used for feeding another type of hydraulic cylinder. Whilst this particular casting was being made, work was still in the experimental stage in the use of exothermic compounds and the point it is intended to emphasize from this is, that if correct consideration had been given in the first place to direct feeding, much subsequent trouble would not have been encountered. Figs. 15 and 16 give a general view

of the cylinder under consideration, and show the method of running. It is the cylinder for a tube-testing machine, and particular note of the bracket at the back should be taken.

In Fig. 17 is shown the first method tried out for feeding this job and, as has already been pointed out, work was in this experimental stage. Actually the thickness of the sleeves were under review at this time and it was the object here to pare this down to a minimum. The actual size of the sleeves shown on this method was $2\frac{1}{2}$ in. and 3 in. giving a sleeve of only $\frac{1}{4}$ in. wall thickness, two sleeves being used on each head making a depth of 12 in. for each. The object of placing the feeder in this position was to get the maximum amount of feed to the cylinder and to take care of feed metal supply for the bracket at the back.

Fig. 18 shows the bore of the cylinder after machining, where there is porosity on the bracket side, and significant is the rather smooth-contoured appearance of the holes as opposed to the usual sharp brittle appearance of porosity. Remedial measures had to be taken to overcome this trouble. It is not usually good practice to make two method alterations at the same time, but in this case two new lines were taken, first one of the feeders was moved taking it over the bracket and the other alteration was made by thickening up the sleeve wall to $\frac{3}{8}$ in. shown at Fig. 19. The feeder was moved to help the bracket section and the sleeve was thickened up as it was considered that the casting which weighed 7 cwt. was too heavy for this thickness of material.

Further Experiments

On machining, the bore was again slightly porous, but it is not proposed to introduce another illustration here, as the porosity and its position was absolutely identical with that observed in the fault of method 1. After due consideration, a complete reversal of policy was undertaken, to come with what would have been done before exothermic feeding. This is shown in Fig. 20, a full head, covering the full diameter of the cylinder, this was 13 in. dia. and 16 in. in height, however, as will be observed after removal of the feeder and machining of the bore; Fig. 21 reproduces an actual photograph of the machined bore. The extent of the porosity had greatly increased, still occurring, however, on the bracket side of the casting; also worth noting is the extremely sharp broken surface of the fault as opposed to the smoothness found previously. What conclusion can be drawn from this experiment as far as it had gone? First, that although exothermic feeding did not produce good castings with the methods used, the results were far more encouraging than using a full unaided feeder with all its greater volume of metal to feed from. Secondly the two methods used were failing in only some slight degree to feed the casting and it was, therefore, necessary to provide the extra bulk of metal and to hold it in its liquid state so that all feed could take place.

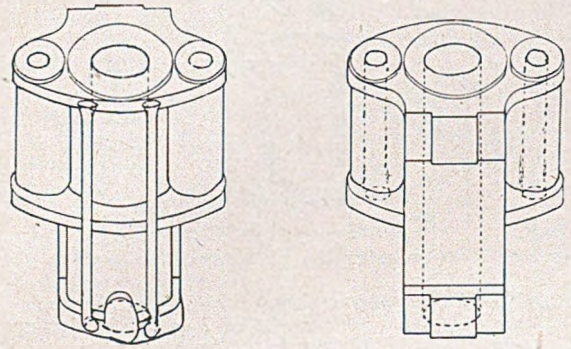
It was necessary to understand that with the use of the compound there was no need to use the complete full head from the test just observed. This fact was borne out from the tests taken on the hydraulic cylinders. Fig. 22 gives an example of the fourth method adopted, in this case the sleeves had an inside diameter of 8 in. and were 12 in. deep and consequently gave full direct feed to the casting. It will, of course, become apparent that this particular cylinder is of the open ended type as opposed to the closed ended type shown in previous illustrations. With a full head the centre core is completely through the feeder and arrangements must be made for centring the core.

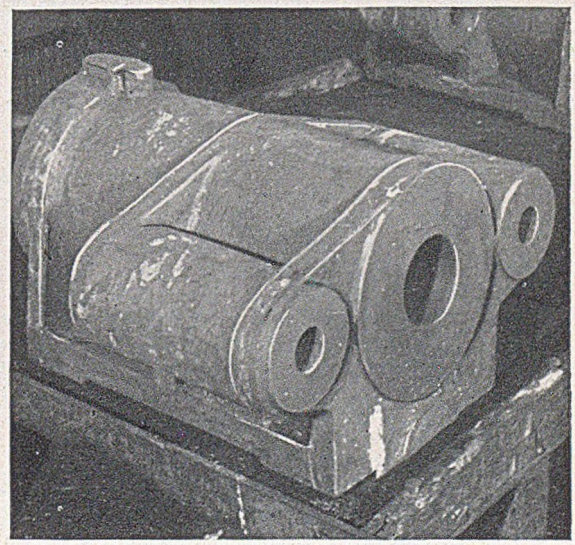
If either of the first two methods had been successful there would have been no need to worry about this centring of the cores as provision had been made to have a coreprint in the top part. Fig. 23 shows the cylinder actually in position on a tube testing machine and shows up particularly the perfectly clean bore.

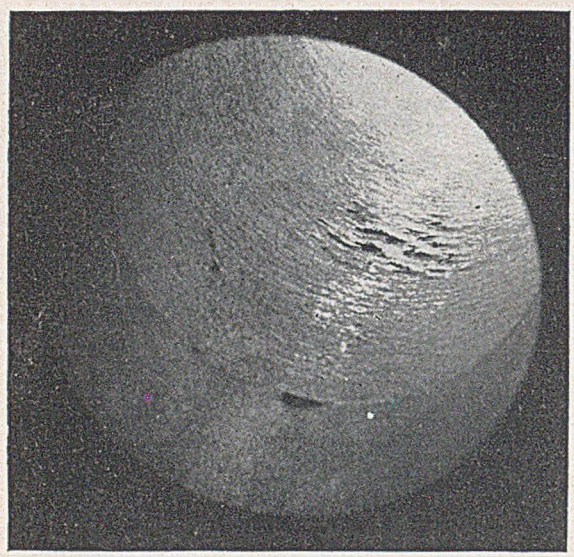
Breaker Cores

The feeder heads described must be removed in the machine-shops and already a saving was being

FIG. 15.—*Front and Rear Views showing the Method of Running a Tube-testing Machine Cylinder; and* FIG. 16, *the Finished Casting.*







shown by the use of the smaller feeder head, however, with the object of reducing the machine-shop cost still further it was decided to insert a breaker core between the casting and feeder head. With the obvious ability of the exothermic sleeve to retain a high temperature in the metal and the ease of topping up, it was considered quite feasible to introduce the breaker core. On the first test, an exothermic insert was introduced in the apperture of the breaker core. The casting was a cylinder, the core being made in this instance of loam 18 in. sq., ¾ in. thick, the insert being ½ in. in depth and spreading 2 in. back from the opening. On pouring this job, as soon as the insert fired off, an eruption occurred in the feeder head, due to the evolution of gas and completely inadequate venting, However, once all gas had evolved and the metal had stopped erupting, feeding went on as usual. After machining, although completely sound after hydraulic test the surface was very broken and rather unsatisfactory. This insertion of exothermic compound has been since discontinued, just a plain breaker core being put in.

Observations on the metal absorption have been taken, using a breaker core and it is quite certain that the narrowing of the aperture in no way impedes the ingress of metal into the casting. The ideal for the size of opening in a breaker core is one-third the diameter of the feeder head, and Fig. 24 illustrates a cylinder showing the break between the casting and feeder. It is obvious that the question of pouring temperatures is going to spring to mind and information on this, with regard to one's own foundry pouring technique, is that optical pyrometer tests have been taken and metal is tapped from the cupola at between 1,400 and 1,425 deg. C. and poured at 1,360 to 1,390 deg. C.

Economics

Taking first the small flywheels, a saving of 10 per cent. was shown on metal costs. In the case of the large flywheels, a saving of 2.33 per cent. in

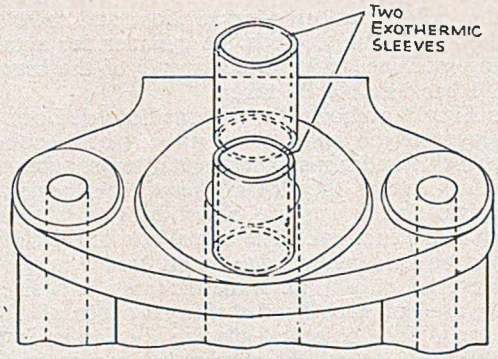


FIG. 17.—*First Method used for Feeding the Tube-testing Cylinder Casting; and* FIG. 18, *the Porosity revealed in the Bore on machining.*

metal costs is made. It would appear that on any size job in cast iron, where there is only need for one or two exothermic sleeves, a substantial saving in cost of metal is made, due to the reduction of residual metal. However, in the case of a job where there is a multiplicity of headers, the saving in cost of metal is toned down. These large flywheels are a case in point. They have six feeders and the amount of compound that goes into the making of the sleeve is quite large and, as stated previously, the saving in metal cost is 2.33 per cent. With the example of the two hydraulic cylinders discussed in detail, the saving in metal cost is very satisfactory, exothermic feeding shows a saving of 23.7 per cent. in metal costs over the former method, added to which must be taken into account the elimination of one machining operation, that of feeder removal.

Conclusions

What conclusions can be drawn from this work? First, in cast iron, these compounds can make the feeding of castings far less wasteful in the use of metal than formerly. It is fair to say that to those prepared to use these materials and study their application the results obtained are extremely satisfactory from two standpoints—sound castings and

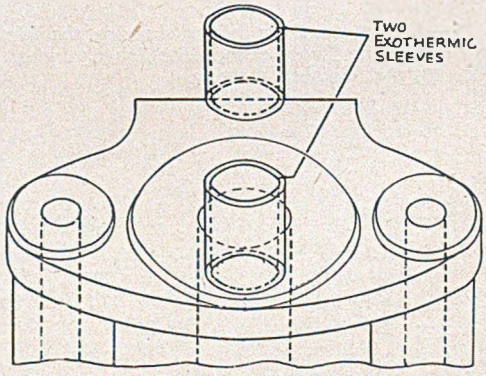


FIG. 19.—*Second Method used for Feeding the Tube-testing Cylinder, which weighed 7 cwt. The Casting again exhibited Porosity in the Bore.*

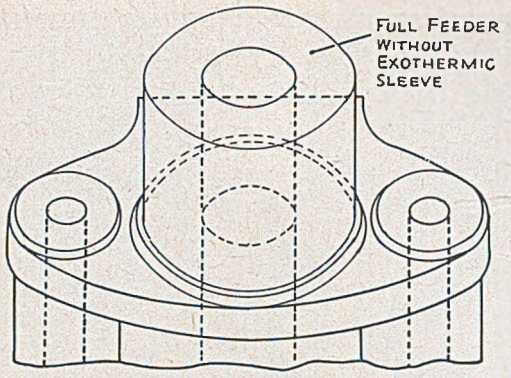


FIG. 20.—*Third Method employed for Feeding the Cylinder, without Exothermic Sleeve. Serious Porosity,* FIG. 21, *was revealed in the Bore.*

costs. Secondly, the statement "study their application," is important. On small work, the cost of the material outweighs its usefulness in its ability to assist feeding. Where it is of value is where there are relatively large volumes of metal to be fed.

Finally the Author takes this opportunity to thank Tangyes, Limited, for providing facilities to allow this work to be done.

DISCUSSION

MR. T. H. TAFT (president) asked if the costs referred to were foundry costs and not machining costs.

MR. GRICE, replied that the machining costs were not included.

MR. HIRD asked if Mr. Grice had found any coarsening of structure under the runner due to slow cooling.

MR. GRICE answered in the negative.

MR. SHOTTON asked how long the exothermic reaction went on for, if, as Mr. Grice had said, the material was liquid in the feederhead for one hour after pouring. Was it the insulating properties or the exothermic properties which gave this result?

MR. GRICE replied that when firing of the feeder took place a rise in temperature occurred. He was not quite sure what part each phase played, as he had not used purely insulating materials.

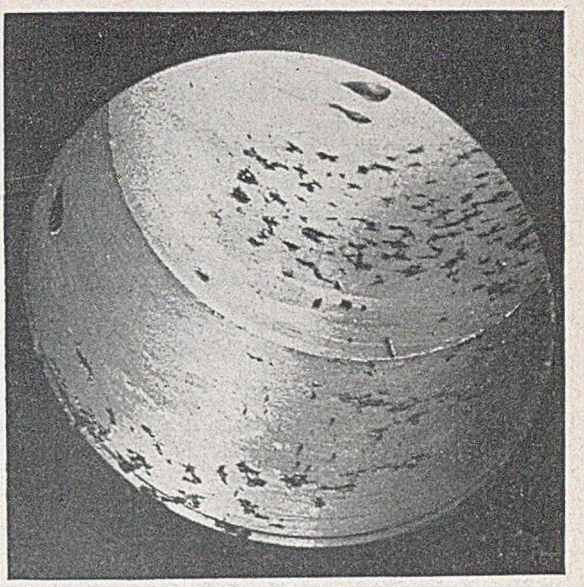
MR. CALLAGHAN said he had recently made two flywheels, 8 ft. dia. with a rim 2 ft. deep, and 10 in. thick. Those weighed nine tons and had four risers on the rim, and one on the boss. It took five men 6 hours to rod-feed the job, five men standing by as spares, and three topping up.

MR. GRICE said that he thought that Mr. Callaghan would need an insulating sleeve 9 in i.d. and 12 in. deep to feed the flywheels, topping up as necessary.

Practical Measures

MR. CALLAGHAN asked Mr. Grice how he stored the sleeves, because in his experience they tended to absorb moisture.

MR. GRICE replied, that they used them as they made them, within 24 hours.



MR. BELL asked if the weight of material fed to the risers during topping up, was considered in the yields.

MR. GRICE replied that this material was not considered because it had become an intricate part of the casting.

MR. HUNTER said that he thought from the composition quoted, most of the irons Mr. Grice used would have had a shrinkage of up to 1.5 per cent. Had Mr. Grice any experience with materials of higher shrinkage, and also of the practice of running into the feederhead without using exothermic sleeves.

MR. GRICE replied that he had had no experience of irons of higher shrinkage, and that most castings would have been difficult to run into the feeder because of the core.

MR. HALL asked whether Mr. Grice had experienced any trouble associated with dross from residues of insulating sleeves getting into the sand and subsequently affecting the remelting of scrap.

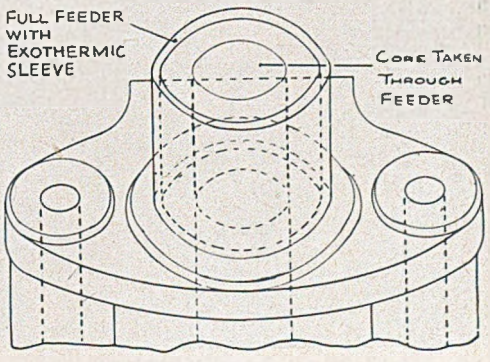


FIG. 22.—*Fourth Method for Feeding the Tube-testing Cylinder, using a Full Feeder and Exothermic Sleeve surrounding the Core.*

Exothermic Feeding of Grey-iron Castings—Discussion

MR. GRICE said that he had had no trouble with sleeves breaking up.

Application to Special Jobs

MR. FRANCIS said that he thought a running feeder was excellent, and that many jobs could be fed without exothermic feeding. It was only for the special jobs that exothermic feeding was useful.

MR. GRICE replied that he had tried to emphasize this in his Paper.

MR. DUNNING asked of what value was exothermic powder placed on the top of a feeder for retarding solidification.

MR. GRICE replied that it had some value, but proper exothermic feeding was much more satisfactory.

MR. WEAVER asked whether the castings mentioned had been cast in green sand.

MR. GRICE replied that the small flywheels had been cast in green-sand, whereas dry-sand had been used for hydraulic cylinders, and the large flywheels.

MR. HALL asked if the porosity in the hydraulic cylinders would have been less had an iron of lower phosphorus content been used.

MR. GRICE replied that they had to try and get the strength required by specification.

MR. TAFT said that with an iron of lower phosphorus content, the costs would increase and Mr. Grice agreed.

MR. CHERRY asked whether the cost of exothermic materials had been taken into account in his figures. MR. GRICE replied in the affirmative.

MR. BOND, referring to the cylinder, asked whether it would be economical to use an insulating material in an internal sleeve.

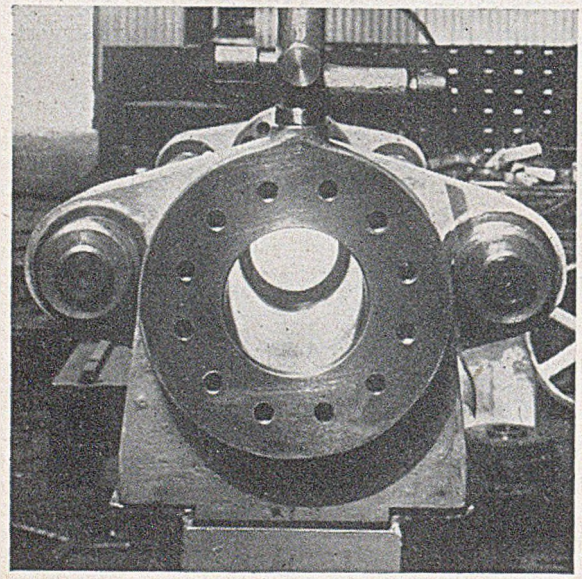


FIG. 23.—*Tube-testing Cylinder Casting (made by Method Four) in Position after machining; the Bore was Perfectly Sound.*

FIG. 24.—*Hydraulic Cylinder Casting, with Feeder Head attached, after using a Knock-off or Breaker Core in the Mould.*

MR. GRICE said that he did not think this was possible.

MR. MERIDITH said that the particular cylinder referred to was badly designed from the foundry point of view.

MR. TAFT said that he had a job to cast in aluminium, which was used for special purposes, and with that he couldn't get a feeder on top and so it had to be on the side.

MR. GRICE said he thought there it would be possible to use a pencil core and surround the runner with an exothermic feeder, Mr. Taft should then get better results.

Iron and Steel Foundries Regulations

A reminder is issued that certain of the Iron and Steel Foundries Regulations come into effect on January 1 of next year. The regulations in question are No. 4 (arrangement and storage), No. 5 (work near cupolas and furnaces), No. 6 (gangways and pouring aisles), and No. 8 (protective equipment). The Chief Inspector of Factories has powers of exemption (set out in Regulation 10) in respect of Nos. 5 and 6; these powers do not apply either to No. 4 or No. 8. Iron and steel founders are therefore advised to give early attention to the requirements of these two regulations.

It will be remembered that regulation 7 (dust and fumes) and regulation 9 (bathing facilities and clothing accommodation) will not come into operation for another two years, namely, January 1, 1956.

Royal Society of Arts

Offer of Endowed Prizes, 1954

The Royal Society of Arts, as trustee for the undermentioned endowments, offers the following prizes during the year 1954:—

Benjamin Shaw Prize for industrial safety.—The Benjamin Shaw Trust was founded in 1876 "for the promotion of improvements in all matters relating to unhealthy and dangerous occupations", a subject in which the Royal Society of Arts has taken a practical interest ever since its foundation in 1754. *A prize of* £20 is offered in 1954 in accordance with the terms of the Trust "for any discovery, invention, or newly-devised method of obviating, or materially diminishing any risk to life, limb or health, incidental to any industrial occupation, and not previously capable of being so obviated or diminished by any known and practically available means". Entries may be in the form of descriptive essays or models.

Fothergill Prize for fire prevention or fire-fighting.—Under the Fothergill Trust (established by the Will of Dr. Fothergill in 1821) *a prize of* £20 is offered in 1954 for a descriptive essay or model embodying some new idea for the prevention or suppression of fire.

Howard Prize for mechanical motive power.—The Howard Trust was established in 1868 for the purpose of making awards periodically to the authors of treatises on steam or other motive agents, and of *a prize of* £20 will be awarded in 1954 to the author a treatise on some aspect of the subject of mechanical motive power.

Conditions of Entry

(1) Entries for the above prizes must be received by the secretary of the Royal Society of Arts, 6/8 John Adam Street, Adelphi, London, W.C.2, not later than July 31, 1954, and must be clearly marked with the entrants' name and address and the prize for which they are submitted. Essays must be typewritten.

(2) The Society cannot accommodate bulky apparatus for judging. Such entries must be submitted by means of written descriptions or models, but the Society may subsequently require a demonstration with the actual apparatus.

(3) The Society reserves the right to divide or withhold all or any part of the above prizes, should the quality of the entries, in the opinion of the judges, justify such a course.

(4) The Society reserves the right to exhibit or publish any entries (the copyright being retained by the competitor).

(5) The Society cannot accept any responsibility for the safety of any papers or models submitted to it for the purpose of these awards.

(6) The decision of the Council of the Society regarding all matters connected with the awards will be final and correspondence cannot be entered into regarding the reasons for any decisions it may take.

Other Offers.—Particulars of the following awards, also offered by the Society, are published separately and may be obtained on application to the secretary, viz :—

(*a*) Awards of various kinds under the Thomas Gray memorial trust for the improvement of navigation and the education of the Merchant Service.

(*b*) Bursaries and prizes under the Owen Jones and Art Congress studentship trusts awarded in connection with the Society's annual Industrial Art Bursaries competition. (This competition is primarily organized

(*Continued at foot of col.* 2)

for the making of substantial awards, subscribed by industry, to students of industrial design.)

(*c*) The Russian Embassy Prize (founded in 1919), awarded in connection with the Society's examinations in the Russian language.

Training for Ironfounding

Industry's New Committee

The ironfounding industry, through its national organization, the Council of Ironfoundry Associations, has appointed a recruitment, training and education committee. Recruitment of new entrants to the industry has not been easy of recent years. Many boys and young men are unaware either of the opportunities for advancement which ironfounding offers—many of the present day leaders of the industry began their careers as workmen or in subordinate positions—or of the great, and permanent, importance of iron castings to the country's economy.

Although the Council has done much to further knowledge of the industry among school-leavers, the work of training new entrants, and the higher education of foundrymen, the feeling among ironfounders now is that these activities should be placed upon a more systematic and effective basis. This is the purpose of the new committee, which represents eighteen associations of ironfounders and two technical bodies—the British Cast Iron Research Association and the Institute of British Foundrymen.

Among individual members of the committee are: Sir Harold West (Newton Chambers & Company, Limited), Mr. N. P. Newman (chairman of the Council of Ironfoundry Associations), Mr. H. V. Shelton (chairman, British Ironfounders' Association), Mr. S. H. Russell (chairman of Trustees, National Foundry Craft Training Centre), Dr. J. G. Pearce, O.B.E. (director, British Cast Iron Research Association), Mr. V. C. Faulkner (Editor, FOUNDRY TRADE JOURNAL), Mr. G. R. Shotton (director, Shotton Bros., Limited), and Mr. W. S. Matthews (training officer, Stanton Ironworks Company, Limited).

Application of Shell Moulding to Steel Castings

(*Continued from page* 747)

ment casting, because it is still dependent upon assembly of separate mould parts and cores. It will be found, however, that many castings which have been produced as investment castings as the only possible method can now be made by shell moulding. This applies more particularly to the rather larger items; for extremely small and intricate components, the precision investment method will probably remain supreme. Examples of typical jobs for the gas-turbine engine which may be produced by shell moulding are elbow joints, "T" pieces, etc., for use on the pipe systems. In addition, serious consideration should be given to the question of producing some of the turbine blades, particularly stator blades, and work on this project is already in hand.

A FIRE on December 1 seriously damaged the main administrative block of the steelworks of Richard Thomas & Baldwins, Limited, Scunthorpe.

Notes from the Branches

Birmingham President's Address

At the inaugural meeting of the session for the Birmingham branch of the Institute of British Foundrymen, members heard a forthright address from their new president, Mr. T. H. Taft, on the right attitude to take in relation to development work. In the course of his remarks Mr. Taft said:—

Development work in the first place, requires brains and skill and it would be difficult for anyone to quarrel with the opinion that there is the necessary ability in these islands. This point of view is substantiated by past achievements for generations, and right up to the present the British claim to be the inventors and pioneers of the larger portion of new ideas and developments in all fields. But can it honestly be said, however, that the same claim can be made in the foundry industry? The point to be stressed is the practical development of ideas to the stage where they are of commercial value.

Personnel engaged on experimental work must be imbued with a team spirit, the academic, technical and practical ideas should be pooled, and agreement reached by everyone concerned, on the goal it is desired to reach (not a very difficult decision to make), a clear idea should be obtained of the line of investigation to take, a definite time factor allowed before results can be expected, and the amount of money to be spent decided. These last two factors being synonymous. All stages of development should be planned and reports given at regular intervals to managements, which would help to alter the attitude of certain die-hards who hold the idea that experimental work costs too much and does not give an economic return. Men on development work should be cost conscious, and appreciate that "time is money" whatever the basis of payment operated, and an appeal should be made to both management and personnel not to ask for, or make promises that cannot be kept, bearing in mind that it is better to start with doubts and finish up with convictions rather than start with convictions and finish up with a whole crowd of doubts.

Bringing in Wider Interests

Considerable time will elapse before our industry is established on the basis of all fundamentals being brought down to an exact science, therefore, whilst present conditions operate much of the job will remain an art. It follows that a logical and commonsense approach will often make for the same rate of progress as the scientific and academic one. Ideas, however brilliant in conception, will have to be proved on the shop floor—the right approach to this part of the problem is important. Many promising developments have failed to reach fruition because some relatively small detail problem could not be overcome. Again, it is emphasized that the man on the shop floor having a different approach will often find a solution if his interest can be held, thereby maintaining progress; team spirit will be strengthened, and mutual respect enhanced. If a man will show he is not ashamed of being in the wrong, he is merely saying, in other words, he is wiser to-day than he was yesterday.

Finally, it is generally accepted that we do not take second place to our friends across the Atlantic on technical matters. Although this may be true, the little lead that may be there, is more than balanced by their approach to development problems, and the enthusiasm and the planning they put into their job. Therefore, I suggest that if founders can impart into their development work, the true spirit of co-operation, they can then say that the motto of the Institute "Science hand in hand with Labour" is in truth being carried out.

Australia (Victoria)

The first annual convention of the Australia (Victoria) branch of the Institute of British Foundrymen was held from November 12 to 14 in Melbourne. It was opened by an address by Sir John Storey, chairman of Ripco Limited. This was followed by a paper from Mr. H. E. Greenbank, on behalf of New South Wales branch of the Institute of Australian Foundrymen, who gave "An Opinion of the State of Metallurgical Control in the Ironfoundry Industry in Australia." The afternoon session was devoted to hearing a paper from Mr. A. Bell on "Patternmaking for Production Castings" and an open discussion on shell moulding.

In the evening, T.S. 38 sub-committee's report, prepared by the Institute of British Foundrymen, was presented as an exchange paper. This was followed by a paper by Mr. E. R. Thomas on "The Ronaldson and Tippett Foundry." The next day (November 13) was devoted to visiting the works of H. V. McKay Massey Harris, and Ajax Pump Foundry, whilst on Saturday, the members heard papers from Mr. C. A. Sanders on "Why Sand Control?" (the American exchange lecture); from Mr. J. Anderson "Preliminary Report on the Manufacture of S-g. Cast Iron in the Electric Furnace," and from Mr. W. H. Dobson on "Gamma Radiography with Radioactive Isotopes." The afternoon was free for delegates to watch cricket and at 6.15 the annual banquet was held. The conference was organized by Mr. H. A. Stephens and Mr. G. D. Thompson, the honorary secretary.

At the October meeting of the same branch, a paper "Production Castings in the Small Mechanized Foundry" was read by J. D. Holt, works manager, Ajax Pump Works. The Author, discussed problems associated with the establishment of a small mechanical section for production castings on a semi-mass-production basis, dealing also with problems associated with the choice of mechanical equipment. Suitable pattern arrangements and moulding-box equipment were discussed and emphasis was placed upon the production-engineering viewpoint and methods of obtaining fully-acceptable castings, as regards surface finsh, close jointing and minimum machining allowance.

Bristol and West of England

A morning meeting of the branch was held on November 21 when a small but enthusiastic company heard a lecture presented by Mr. G. W. Nicholls on "Efficient Production Methods for Machine-tool Castings." Members found particular value in the talk as many of the castings illustrated and described by Mr. Nicholls were much larger than those produced in West-of-England foundries. One point which was made apparent to the audience was the need for careful quality control of all processes, whether melting, moulding-sand preparation, etc. Mr. Nicholls stated that since this form of quality control had been established in the particular plant under consideration, scrap had been reduced by 50 per cent. in a comparatively short time. Not only did Mr. Nicholls emphasize this, he also stressed the need for close co-operation between design staff and all the foundry departments—a slight alteration in the design of a component could often save hours of work in the foundry without impairing the efficiency of the casting.

In replying to questions, Mr. Nicholls stated that radiography could only be considered justified when the probable location of trouble was at some known spot in a casting. As a routine inspection method, the cost

of examining large casings would be prohibitive. Insulating sleeves were considered ideal for use on certain types of castings, but care should be exercised in the selection of the particular sleeve for any given casting —a badly-designed casting could render any insulating sleeve useless, since any benefit which might be obtained from the sleeve could be nullified by poor or bad running technique. It was the speaker's view that chills should only be used once, and that when coating chills it was preferable to apply the coating medium over a matte rather than a ground surface. In proposing a vote of thanks to Mr. Nicholls, Mr. Heath said he was sure all members present had learned much from the paper, a feeling echoed by Mr. Balme, who seconded.

London Branch—East Anglian Section

The annual dinner of this section was held on November 13, at the Oriental Cafe, Ipswich. Approximately 60 members and guests were present, including the president and secretary of the parent branch, Mr. B. Levy and Mr. W. G. Mochrie. The dinner was followed by a short concert given by local artistes. The arrangements were again in the able hands of Mr. H. Ward, president of the section.

A meeting of the section took place on November 17, when the speaker for the evening was Mr. A. P. Lovat, whose Paper "Production of Silica and Moulding Sands", outlined the mechanical methods used in quarrying, the degree of supervision necessary to produce the different types of sands needed, also the methods used to seek out new ways of blending and processing sand to improve the efficiency and quality of the product for use by founders. The Paper was also illustrated by a short film. It was followed by an interesting discussion, questions being asked about sand properties and various methods of processing, etc. The meeting concluded with a vote of thanks to Mr. Lovat proposed by Mr. Dobbie, who said that considering Mr. Lovat admitted he was not a foundryman, he had been very instructive, and had shown a keen insight into the problems associated with the foundry industry.

Tees-side

The Tees-side branch is organizing an apprentice competition divided into four sections: patternmaking, ironfounding, steelfounding, and non-ferrous founding. Three prizes are being offered and entries have to reach the secretary not later than December 31. The competition is different from the usual run as the entrants have to make a pattern or a casting in their normal place of working.

Inadequate Supervision Blamed

Mr. Commissioner Sachs at Birmingham Assizes awarded £3,724 damages and costs to James Quirk against Morris Motors, Limited, for personal injuries received through the alleged negligence of the defendants. For the plaintiff it was stated that when standing on a plank, painting the roof of defendants' works at Foleshill, Coventry, a batten supporting one end of the plant gave way and Quirk fell 25 ft. to the ground. His injuries were such that his left leg had to be amputated. In defence it was stated that plaintiff was the author of his own misfortunes since he had been told the correct way to erect the scaffolding with poles and hooks and had not followed the proper procedure. The Commissioner held, however, that the cause of the accident was lack of proper supervision.

Parliamentary

Technological Education

When MR. LEE asked the Chancellor of the Exchequer whether the Government would establish a college of technology, MR. BUTLER said that, as announced on January 27 last, the Government proposed to develop higher technological education in London by building up the Imperial College of Science and Technology. Outside London, the University Grants Committee had invited universities and colleges which were concerned with higher technological education on its grant list to submit their plans for development. When all these plans had been received and examined it would be possible to make a further statement.

MR. LEE asked the Chancellor whether he would not agree that the recent Government announcement of the restoration of the cuts made upon the Department of Scientific and Industrial Research could not really succeed unless we could wed science more closely to industry, and that it would, therefore, be the correct policy to give to some college university status in order that we could produce more technologists and scientists to assist in this process. He suggested that Manchester would be an ideal centre for such a university.

MR. BUTLER, in reply, said it was quite clear that the Government intended to go forward with higher technological education and to afford status to the institutions thereby endowed. The first one to be mentioned here was London, but it was quite clear that Manchester was well in the running for a further place. There was also a certain institution in Scotland envisaged. He hoped that the House would realize that the Government meant business in this matter.

German Exports

"I have no evidence that the export of capital goods, including locomotives, is directly subsidized by the Government of Western Germany, but all German exporters receive some benefit from the remission of a proportion of their tax payments," said MR. D. HEATHCOAT AMORY, Minister of State, Board of Trade, when replying to questions by MR. GRIMOND and MR. FIENBURGH. The Minister added that the British Government had taken a lead in international efforts to eliminate export incentives of this kind which amounted to indirect subsidies. The Government was taking up through the various agencies the question of the discontinuation of all export subsidies by Government.

Asked if he was aware that credit terms offered to various German manufacturers were such as to appear to be disguised subsidies, Mr. Amory said that the Government was looking into that matter, too, but though the question of credit available might have some influence on these lost orders, price was the main reason.

THE Draft Iron and Steel (Compensation to Officers and Servants) (No. 1) and (No. 2) Regulations were approved in the House of Commons recently.

THE MINISTER OF LABOUR said recently that the number of operatives reported by firms in the metals, engineering, and vehicles group of industries to be working short time fell from 32,000 in the week ended May 23 to 13,000 in the week ended August 29 (the latest date for which statistics were available). He was not aware of any general increase in under-employment in these industries since August. The number of persons registered as unemployed in the same industries decreased from 75,000 in March to 45,000 in October.

Qualcast sued by Employee

Mr. James Thorpe, of Osmaston Road, Derby, was awarded £130 11s. 7d. damages against his employers, Qualcast, Limited, Derby, by Judge Sir Henry Braund, at Derby County Court last week.

Mr. H. G. Talbot, for Thorpe, said the claim was for damages for personal injuries received by Thorpe at the Qualcast factory on March 27, 1952.

Thorpe, who was employed as a pattern moulder, sustained the injury when some molten metal which he was catching in a hand ladle, fell on his left foot. As a result, Thorpe had to have two small skin grafting operations, but he was not expected to suffer any permanent disability.

Special damages of £80 11s. 7½d. had been agreed, Mr. Talbot said, subject to liability.

Mr. Thorpe told the Judge that he had worked with the firm for 20 years and had been a pattern moulder for five years. On the day of the accident he had gone to a cupola in the die-casting shop to get some metal in a hand ladle. As there were several bull ladles waiting to be filled he climbed up on a platform and lowered his ladle into one of the bull ladles to catch a supply of metal. This was the usual practice. As he withdrew his ladle, three-parts full, metal from the stream hit the back of his ladle and then splashed on his leg. Thorpe said he used this method of filling his ladle because he understood that the die-casting machines could not be kept waiting and the bull ladles could not be taken away from the cupola until they were filled.

Mr. I. Sunderland, for Qualcast, Limited, said there was no evidence that the firm expected their workmen to take any risk unusual in the industry. Protective spats were available free to any workman who asked for them, but Thorpe had made no application.

Trade Unions in 1952

Part 4 of the report of the Chief Registrar of Friendly Societies (Sir Bernard White) has recently been published. Apart from political funds, the report relates only to the transactions of registered unions. It is estimated, however, that, so far as unions of employees are concerned, the membership of registered unions represents about 90 per cent. of that of the whole of the trade union movement in Great Britain. During the years 1937-1952, the membership of unions of employees increased from 4,214,000 to 8,377,000 and their funds from £16,032,000 to £67,607,000. Thus the average funds during this period have increased from £3 16s. to £8 1s. per member.

The expenditure of trade unions falls under three main headings: "working expenses," which represent the expenditure necessary to maintain the organization and carry out its primary objects; "trade benefits," such as unemployment and dispute pay; and "provident benefits," which are similar to those provided by friendly societies and range from sickness and accident pay to superannuation and funeral benefits. The extent of these provident benefits, the report says, is not always realized, but in 1952 payments for sickness, accident and funeral benefits amounted to £1,767,000 and for superannuation pay to £2,039,000. Payments for provident benefits in 1952 represented 22.5 per cent. of the total expenditure for the year as compared with 4.2 per cent. expended on trade benenfits and 58.6 per cent. on working expenses. In 1936, comparable percentages were 30.3 on provident benefits, 11.6 on trade benefits, and 41.2 on working expenses. The report is published by H.M.S.O. (price 1s. 3d.).

Standard Packaging Code

Foundrymen and enamellers, especially those sending out finished goods, are often discouraged by the evidence of poor handling of containers in transit, and there is little doubt that much of the damage sustained by packages is due to inefficient handling. There is little that the packer can do to control the treatment given to his goods after they leave his factory. There is, however, a great deal that can be done to improve the handling of packaging materials and filled containers during movement from one part of the factory to another or during the loading on to vans or wagons for the first stage of their journey. Manual handling, however experienced the operator, is expensive in time and labour and the use of an efficient system of mechanical handling generally results in a reduction of accidents with a consequent greater safety to the operatives and less damage to the goods. With this in mind, the British Standards Institution has prepared a section of the Packaging Code (B.S. 1133, section 4) dealing with mechanical aids in package handling. It describes the many types of equipment available and gives notice to assist users in selecting equipment and using it to the best advantage. This section contains about 80 illustrations of typical pieces of equipment likely to be of use to packers. Copies of this section of the Code may be obtained from the Institution's sales branch at 2, Park Street, London, W.1. (price 6s.).

Ouzledale Foundry Reorganization

Mr. J. K. Haighton, who recently resigned from the position of manager for Richard Haighton, Limited (a subsidiary of Pope & Pearson, Limited), Vulcan Iron Works, Nelson and Burnley, has now been appointed progress and development engineer for the Ouzledale Foundry Company, Limited, ironfounders, of Barnoldswick, via Colne, Lancs, manufacturers of a range of all-night firegrates. Two additional representatives have also been appointed to deal with expanding business, Mr. J. D. Mills, of Fleet, Hants, who will represent the London and home-counties area; and Mr. S. E. Elsmore, of Walsall, Staffs, to represent the firm in Birmingham and the Midlands.

The Ouzledale Foundry Company, Limited, have much improved their plant and equipment, and further evidence of this is to be found in an ambitious programme to be completed in the new year. This includes a mechanized moulding plant in addition to the already extensive moulding shop, large fitting and assembly bays and a modern office block. Facilities for employees have also been fully catered for by the installation of shower-baths, clean-clothing lockers, and a canteen capable of catering for 200 meals at one sitting.

Foundry Equipment.—As a means of advertising, the reviewer has often expressed personal dislike of folders, because they usually lack the quality of permanency and fail to find a proper place in the office files of business literature. However, one received from the Molyneux Foundry Equipment, Limited, of Marlborough Works, Marlborough Road, London, N.19, has the merit of being an artistic production. On opening it discloses a chequered pattern and illustrates in each of the six squares, a grinder, a mould dryer, a fettling bench; a core-blower and two types of moulding machines. Of its type, this folder is an excellent example of the good use of limited space. It is available to readers on writing to N.19.

New Ultrasonic Testing Method

By Thomas A. Dickinson

Comprehensive cross-sectional views—showing the exact size, shape, and location of defects in castings—are now being obtained by means of a new ultrasonic test method developed by Electro-Circuits, Inc., Pasadena, Calif, U.S.A. In general, the new process is related to older ultrasonic test methods to the extent that it involves the use of acoustical phenomena which make it possible to: (1) Generate a high-frequency vibration or "inaudible sound" with the resonance value of a given inspection medium by using oscillating current to expand and contract a piezo-electric crystal; (2) propagate the sonic impulse through the test medium until the impulse comes in contact with a non-resonant substance—such as the gas retained by a defect within the medium or a surface which supports the test specimen; (3) detect and amplify "echoes" produced when ultrasonic vibrations make contact with non-resonant media; and (4) convert the amplified echoes into visual signals which can be projected on to the face of a cathode tube, calibration of which is such that echoes produced by flaws can be quickly and accurately distinguished. Fig. 1 shows a schematic layout of the equipment devised.

Conventional Methods

With conventional ultrasonic testing facilities, all this is usually accomplished by "contact scanning"—that is, by manually holding a crystal transmitter/receiver unit in close contact with one surface of a test specimen. Close contact is essential because ultrasonic vibrations of the types used in testing materials have frequencies ranging upward from about 1,000,000 cycles per sec., and consequently cannot be effectively propagated through the thinnest layer of air (although they will penetrate most liquids and solids).

Contact scanning remains an effective method of testing materials with relatively smooth and flat surfaces. But, as the method was previously operated, it was difficult to ascertain the size, shape, and location of an internal flaw because each defect produced a visual signal with approximately the same size and location on the face of the cathode tube.

New Contact Medium

Where the new ultrasonic testing technique is employed, castings with highly-irregular surfaces can be effectively tested because both the inspection medium and the vibrating piezo-electric crystal are immersed in a fluid (usually water, although other liquids such as mercury and oil have served the same purpose). The liquid, of course, serves as a conductor for the ultrasonic impulses.

Considerable energy is echoed when ultrasonic impulses, travelling through a fluid, first encounter the inspection medium. However, if the frequency of the signal is in reasonable conformity with the acoustical properties of a casting, enough energy will

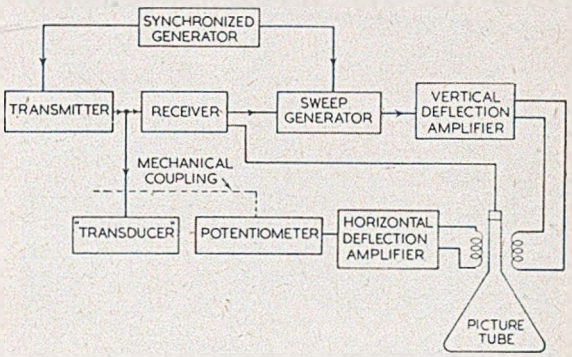


FIG. 1.—*Schematic Layout of Equipment used by Electro-Circuits Inc. (America), for the Ultrasonic Testing of Materials.*

enter the casting to produce a secondary echo which will indicate the presence or absence of an internal flaw.

Because there is no need for contact between a piezo-electric crystal and the surface of an inspection material, the crystal can be manually or mechanically moved back and forth over the test specimen—transmitting and receiving hundreds of ultrasonic impulses per second. This is analogous to the scanning operation which makes it possible to transmit and receive television signals. Fig. 2 shows the operation of "scanning" a casting.

Possibilities of the Method

Consequently, if immersion-scanned echoes are amplified and properly projected on to the screen of a cathode tube, it becomes possible to observe the size of each internal flaw and the location of the flaw with reference to the upper surface of the inspection medium. This, in turn, makes it possible to distinguish insignificant flaws from the sort of internal defects that merit rejection of the casting.

Visual signals produced with immersion-scanning equipment are made to impinge on the face of a cathode tube having a special phosphorescent screen, which causes each to glow for many seconds. Thus, a large number of signals representing a multitude of details in the cross-section of a casting can be simultaneously viewed and (if necessary) recorded with photographic equipment (Fig. 3).

Apparatus

The specific design details of the mechanical devices used in immersion-scanning different articles depend to a great extent on the nature of the products that must be tested in each circumstance. For production purposes, it is generally desirable to have a special tank for the immersion solution. However, since the tank may be very large or very small, this cannot be regarded as a serious limitation. Where the construction and use of tanks has been

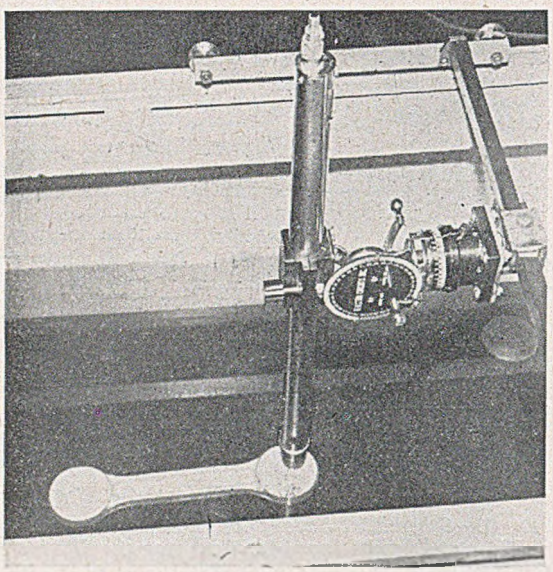


FIG. 2.—*Casting Immersed in a Water-filled Tank and Scanned with an Ultrasonic Search Unit.*

impractical, as in the inspection of underground pipelines and major items of plant equipment, special immersion fixtures have been employed. The usual purpose of such fixtures is to keep a steady stream of water flowing over the piezo-electric crystal and a surface of the article being tested.

The piezo-electric crystal is usually installed in a tubular housing or "search unit," which is adjustably mounted so that its output can be directed at a test specimen from any desired angle. Such focusing is advantageous because flaws in different materials produce echoes having varying magnitudes in accordance with the angle from which they are scanned. For example, a crack may appear to have pin-point dimensions if it is scanned from one end; but, if it is scanned from the side, it may turn out to be a flaw extending several inches through the metal.

Frequencies

Output frequencies of standard crystals for the immersion scanning of castings range from about five to 25 megacycles. These are somewhat higher than the frequencies previously used in ultrasonic testing work, and they are superior because they permit the detection of flaws such as inclusions which might not otherwise be located. High ultrasonic frequencies are not practical where contact scanning methods are employed, because they necessitate the use of extremely-thin piezo-electric crystals, which can be easily scratched or damaged when they come into contact with other materials.

Comparisons

The cost of constructing and operating immersion-scanning facilities is said to be comparable to the cost of standard X-ray facilities. However, ultrasonic and X-ray test methods are not directly comparable in other respects. For one thing, X-rays indicate the total thickness of a material or product; and, if less material is present than was expected, the existence of a flaw must be ascertained in terms of the size, shape, and location of the "missing material." Ultrasonic equipment, on the other hand, indicates a sharp change in density; and, if such a change occurs at some unexpected point, immediately-obvious evidence of a possible flaw is obtained. Secondly, where X-rays indicate the location of a void in two dimensions and show most clearly those voids whose length is parallel to an X-ray beam, ultrasonic scanning can be used to identify a flaw in three dimensions and is usually most sensitive to those defects which are "normal" to a sonic beam see Fig. 4.

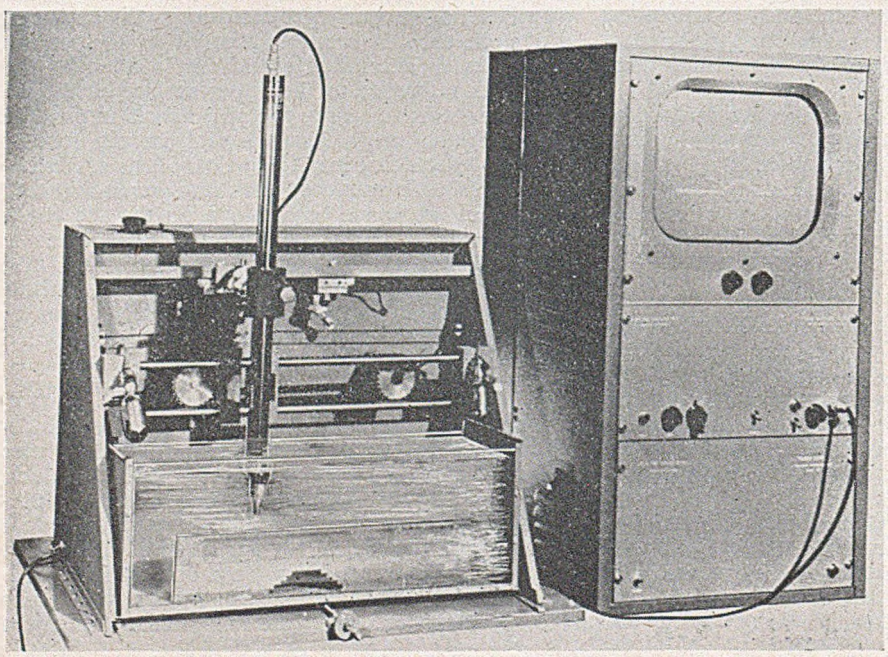


FIG. 3.—*A Test Specimen immersed in the Glass-walled Tank (lower, left) has been machined so that "Flaws" were visible from the side, but not from overhead, where it was Scanned by an Utrasonic Search Unit. Note the image produced on the Television-type Cathode Screen (upper, right).*

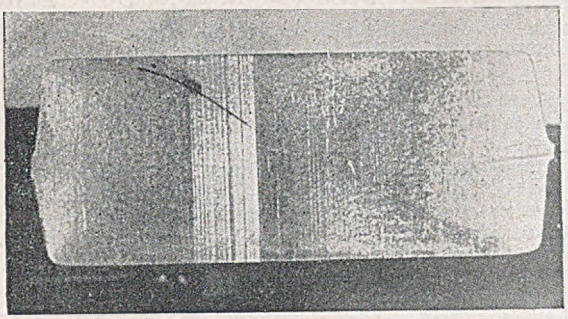


FIG. 4.—*X-rays showed a Test Specimen had apparently no defects, but Ultrasonic Testing Equipment indicated the Presence of an Internal Crack. On Sectioning the Specimen, the Crack was revealed.*

Furthermore, it is worth noting that ultrasonic investigation can be used in the inspection of many materials the dimensions or compositions of which are such that they cannot be penetrated by gamma radiations of the type now used for test purposes. Such materials include thick steel castings and relatively small castings made of lead, and brass alloys.

Like gamma radiations and all other forms of energy, ultrasonics can be dangerous in certain circumstances. However, no special safety measures are essential to the use of ultrasonic test equipment because the energy generated therewith is of low intensity and (as previously noted) will not penetrate a thin layer of ordinary air.

Iron-ore Imports

Iron-ore imports in October and the total for the 10 months of the year to date, with comparative figures for 1952, are shown below.

Country of origin.	Month ended October 31.		Ten months ended October 31.	
	1952.	1953.	1952.	1953.
	Tons.	Tons.	Tons.	Tons.
Sierra Leone	79,400	42,760	659,191	626,096
Canada	65,605	94,840	603,742	953,697
Other Commonwealth countries and Eire	32,220	25	50,102	176,254
Sweden	296,391	332,598	3,030,421	3,183,401
Netherlands	5,437	3,070	30,635	24,297
France	38,243	32,537	355,164	376,253
Spain	45,496	35,122	589,764	382,979
Algeria	136,289	169,084	1,436,494	1,589,550
Tunis	55,580	63,320	488,139	483,717
Spanish ports in North Africa	10,500	—	224,888	—
Brazil	9,004	26,287	82,359	253,176
Other foreign countries	78,259	123,879	620,002	1,188,185
TOTAL	852,424	923,522	8,176,901	9,237,665

Wage Calculating Tables

Designed primarily for the road haulage industry, but of use for other 44-hr. week workers, the R.H.46 Wage Calculator shows at a glance the exact wages due for the number of hours worked. Copies are obtainable at 1s. 6d. post free, from Eric Cant, 9, Billet Lane, Hornchurch (Essex).

Iron and Steel Institute

Special Meeting in Sweden

At the invitation of the Board of Jernkontoret, a special meeting of the Iron and Steel Institute will be held in Sweden from June 5 to 19, 1954. The meeting has been divided into three parts:—

First Part (*June* 5-10).—Preliminary to the main meeting, visits to works and other places of interest will be made at Gothenburg, Västeras, and Surahammar. Departure from London by steamer will be on June 5; Gothenburg, June 7 and 8; Västeras, etc., June 9; arrival Stockholm, evening June 9.

Second Part (*June* 10-12).—The main meeting in Stockholm will begin with a reception at Jernkontoret on the evening of June 10. There will be a technical session on the morning of Saturday, June 12, followed by visits to works and places of interest. Evening entertainments are to be provided. The departure from London by steamer is on June 8; arrival at Stockholm, June 10. Arrangements can be made for members who prefer to travel by air to join the above parties at either Gothenburg or Stockholm; they can return from Stockholm on June 13 or later.

Third Part (*June* 13-19).—After the main meeting, there will be three alternative excursions, by special sleeping car trains, to Swedish industrial centres. The first two of these to Värmland (Hellefors, Uddeholm, Bofors, etc.) and Dalecarlia (Sandviken, Domnarfvet, Falun, Fagersta, etc.) will leave Stockholm on the evening of Sunday, June 13, and return to Stockholm on June 17, or to Gothenburg for connection to steamer, arriving London on June 19. The third excursion to Lapland (Narvik, Kiruna, Gällivare, Lulea, etc.), will leave Stockholm on the morning of June 13, and return to Stockholm on June 18, to connect with the steamer leaving Gothenburg on June 19 and arriving London on June 21.

Rehabilitating the Disabled

To restore shattered lives to something approaching normality calls for action beyond the miracles of surgery and medicine. A disabled person must be able to take his place in a productive capacity with his fellow-workers once more. At Sheffield recently, the British Rehabilitation Council, in association with Sheffield University Department of Social and Industrial Medicine, tackled this problem, and to show what could be done, Dr. R. A. Trevethick introduced six disabled workers from the Steel, Peech & Tozer Branch of the United Steel Companies, Limited. One, for example, whose left arm and leg and right thumb had been amputated, was recently trained as a telephone operator.

At national level, the Ministry of Labour formed, in 1945, Remploy, Limited, the annual meeting of which took place on the same day as the Sheffield conference. Sir Robert Burrows disclosed that there were now 90 Remploy factories employing some 6,000 disabled workers and producing a wide range of goods, including light engineering manufactures. Nearly £2,380,400 was lost in the last financial year, but this was about £62,000 less than in the previous year. As Sir Robert pointed out, the national revenue benefited from income tax paid by the workers, purchase tax paid on their products, and the saving in financial assistance which they would have received had they not been employed.

Personal

DR. P. H. SYKES has been appointed a director of the British Oxygen Company Limited.

MR. J. H. GREENWOOD, who has been works manager of the Caledonia Engineering Company, Bradford, for 33 years, has been presented with a clock on his retirement.

MR. G. J. SHAW has been awarded the degree of Ph.D. by the Birmingham University for his work on the structures of cast iron produced by the continuous casting process.

MR. R. I. TAYLOR is relinquishing his position as metallurgist, Suffolk Iron Foundry, Limited, to take up an appointment with Guest Keen & Nettlefolds (Cwmbran), Limited, as chief metallurgist.

MR. JOHN MACNISH of the Charterhouse Industrial Development Company has been appointed a director of Aluminium Castings Company, to fill the vacancy caused by the death of Mr. R. S. DYBALL.

MR. L. GREENWOOD, chief electrical designer in the machine department of the Chelmsford (Essex) works of Crompton Parkinson, Limited, has been invited to become a Fellow of the American Institute of Electrical Engineers.

DR. C. J. MACKENZIE, president of Atomic Energy of Canada, Limited, and chairman of the Atomic Energy Control Board, has been awarded the Kelvin Medal of the Institution of Civil Engineers for his work in scientific engineering.

The Coal Utilisation Council has elected MR. J. STANLEIGH TURNER president of the council for the fifth successive year. SIR JOHN CHARRINGTON has been re-elected vice-president, and he, Mr. Turner, SIR WILLIAM MCGILVRAY, and MR. H. V. SHELTON are confirmed as trustees for another year.

MR. H. WILLIAMS has been appointed manager of the Worcester branch of British Insulated Callender's Cables, Limited, in succession to the late Mr. C. H. Panting. He joined the former British Insulated Cables, Limited, in 1932, as a sales engineer at Swansea, later transferring to the Cardiff office.

MR. L. H. COOPER, chairman of the Mond Nickel Company, Limited, has been elected a vice-president of the parent company, The International Nickel Company of Canada, Limited. Dr. John F. Thompson, chairman of Inco, announced that Mr. Cooper will assume the new office on January 1, 1954.

PROF. N. F. MOTT, F.R.S., is to succeed SIR LAWRENCE BRAGG, who for the past 15 years has occupied the Cavendish Chair of Experimental Physics at Cambridge University. Prof. Mott, who is 48, has been Henry Overton Wills Professor of Physics and director of the Henry Herbert Wills physical laboratories at Bristol University since 1948.

MR. A. H. BRINKMAN, who was formerly manager of the Portsmouth branch of the heating and air-treatment division of the Brightside Foundry & Engineering Company, Limited, has now taken up the branch managership at Liverpool. MR. P. BAVERSTOCK, who lately held an executive post at the London office of the company, has now become branch manager at Portsmouth.

UNIVERSITY COURT work will not be new to Mr. J. B. Mavor, chairman of Mavor & Coulson, Limited, manufacturers of mining machinery, etc., of Glasgow, who has been appointed assessor to Dr. T. J. Honeyman in his capacity as Rector of Glasgow University, for in 1950 he served as assessor to Mr. Walter Elliot, after the death of Sir Frederick Stewart, chairman of Thermotank, Limited.

About 100 industrialists from all parts of the north gathered at Newcastle-upon-Tyne to make a presentation to MR. F. C. WAKE, who has given up his post Northern Regional Controller for the Ministry of Supply. Sir Claude D. Gibb, managing director and chairman of C. A. Parsons & Company, Limited, founders and engineers, of Newcastle-upon-Tyne, presented Mr. Wake with a cocktail cabinet on behalf of the industrialists.

MR. ANDREW THOMPSON, secretary of Smith, Patterson and Company, Limited, the Blaydon-on-Tyne firm of ironfounders, and their subsidiary company, Taylor Stoker Company, Limited, of London, has this week (December 14) completed a remarkable record of service. Although he is still only 64 years old, he has completed 50 years' continuous service with his firm. The directors entertained Mr. Thompson at a small party held to celebrate the occasion, for, as Mr. W. McC. Dodds, joint managing director, pointed out, Mr. Thompson's achievement was one which was hardly likely to occur again in the firm's history.

Obituary

MR. WILLIAM F. DUNNE, who had been in business at Sunderland as W. F. Dunne, Limited, shipping engineers' agents, has died at the age of 56.

The death has occurred of MR. WILFRED J. TEMPLE, who was once secretary of the former Tees shipbuilding firm of Railton, Dixon & Company, Limited. Since 1924 he had been with Fergusson, Wild & Company, Limited, ore merchants, etc., of London, E.C.3.

The death has taken place of MR. THOMAS DAVIES, who was, until his retirement some months ago, works superintendent of the Laycock Engineering Company, Limited, Sheffield. Mr. Davies, who was in his early sixties, had been associated with the company since its earliest days. He was awarded the M.B.E. in 1944.

A RECOGNIZED AUTHORITY on steam locomotive design for 47 years, MR. F. H. B. HARRIS, formerly chief draughtsman of W. G. Bagnall, Limited, has died at the age of 81. He was with Bagnalls for 15 years and before that was chief draughtsman of Kerr Stuart & Company, Stoke-on-Trent. He retired in 1947 but worked part time for some years later.

The death is announced of MR. HUGH WYLIE, chairman of the Sussex Rubber Company, Limited. His several directorships included those of the engineering firms of Cornercroft, Limited, London, S.W.1, James Beresford & Son, Limited, Birmingham, Lancia (England), Limited, Alperton (Middx), and Macdonald Gibbs & Company (Engineers), Limited.

MR. REGINALD FROST, who died recently, was blast-furnace superintendent at the Margam Works of the Steel Company of Wales, Limited, from January, 1951, until his recent retirement through ill-health. After being assistant blast-furnace manager at Dowlais, he was appointed to a similar post at Ebbw Vale in 1920. He became assistant blast-furnace manager at Margam in 1933. As manager of that department between 1937 and 1951, Mr. Frost was associated with much of the reconstruction of the blast-furnace plant.

News in Brief

THE ITALIAN BELL FOUNDRY of Vittorio Veneto this year celebrated the 500th anniversary of its foundation.

AT THE ANNUAL GENERAL MEETING of the Engineers' Guild it was stated that the Guild now has nearly 3,600 members.

AT THE ANNUAL PRIZE distribution of the Wolverhampton Die Casting Bowls Club, Mr. F. Lee received the Private Greens League Trophy.

THE DUNLOP RUBBER COMPANY LIMITED have created a division for the technical development, manufacture and sales of belting at their Speke factory.

THIRTY EMPLOYEES of Hadfields, Limited, Sheffield, received 25 years' service awards recently, and became members of the firm's "25 Association."

BRIERLEY HILL MANUFACTURERS AND TRADERS' ASSOCIATION donated the prizes for the Brierley Hill Schools Art Exhibition which opened last week.

TWELVE LOCAL AUTHORITIES in Scotland are considering proposals for the setting up of smokeless zones, according to the Scottish Fuel Efficiency Committee.

THE ENGINEERING CENTRE, LIMITED, Glasgow, has now been voluntarily wound up and Mr. William Ure Primrose Lawson, C.A., 115, St. Vincent Street, Glasgow, appointed liquidator.

LONG-SERVICE CERTIFICATES have been presented to 15 employees of Bradley & Foster, Limited, ironmakers, etc., of Darlaston, who have completed 25 years' service with the firm.

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, announce that Mr. H. Williams, M.B.E., T.D., A.M.I.E.E., has been appointed manager of the Worcester branch of the company in succession to the late Mr. C. H. Panting.

MR. ALLAN AVISON, director of the David Brown Corporation, has secured, in face of keen German competition, a contract for industrial gear-boxes and equipment worth over £100,000 from an Indian cement manufacturer.

SIR JOHN WOODS, a director of the English Electric Company, Limited, was present at the company's works at Thornbury, Bradford, last Saturday, when certificates and trophies won by the firm's apprentices were presented.

MEMBERS of the Federation of Light Metal Smelters announce that, until further notice, their maximum selling prices for the undermentioned alloys will be as follow:— LM1, £135; LM2, £145; LM4, £152; LM6, £180, all per ton.

THE COLLEGE OF PRODUCTION TECHNOLOGY, Swinford Old Manor, near Ashford, Kent, is organizing courses of lectures in all the main industrial centres of this country, starting in January. Details are available from the secretary of the College.

THE TECHNICAL RESOURCES of two concerns—International Combustion Limited, and Carl Still (European designers of coke-oven plant)—have been combined in a new organization: International-Carl Still, with offices at 19 Woburn Place, London, W.C.1.

A DEVELOPMENT PLAN of Hadfields, Limited, Sheffield, for producing precision castings for the aircraft and allied industries, by the precision investment process, was announced recently by the firm's managing director, Mr. H. Humphries.

NEW WORKS costing about £5,000,000 are to be built in England by Associated Portland Cement Manufacturers, Limited. One of the works is to be near Cauldon (Staffs), and the other near Westbury (Wilts). The capacity of each will be 175,000 tons a year.

A SILVER TEA-SERVICE, the gift of the Wednesbury, Darlaston and District Manufacturers' Association, to Wednesbury Corporation was handed over by the president, Mr. Len Prichards, at the meeting on December 7 of the Wednesbury Borough Council.

FEWER WORKERS are seeking to improve their education and knowledge of affairs, says the annual report to the Court of the University of Sheffield. The increasing strain of industrial life, the complications of "shift" working, and the calls, trials, and distractions of modern life are the reasons given.

NATURAL GAS may be conducted to central Canada from Alberta by pipeline within the next few years. According to Mr. C. D. Howe, Canadian Minister for Trade and Commerce, a pipeline for natural gas costing about $300,000,000 would take two years to build, and work might start next summer.

T. W. WARD LIMITED announce that Mr. H. W. Secker has been appointed chairman as Mr. G. Wood is to resign at the end of this year but is to become vice-president. Mr. Arnold Carr is to become assistant managing director and Mr. R. F. Stagg, at present a local director, has been made a director.

FOLLOWING their successes this year, Aston Martins have an even more ambitious programme for next year. Mr. David Brown, head of the Huddersfield engineering firm which bought out the Aston Martin firm after the war, is taking a team of three DB.3S cars to Buenos Aires next month to compete in the Argentine 1,000-kilometre race.

THE PHOTOGRAPHIC SOCIETY of Ley's Malleable Castings Company, Limited, Derby, have held their first birthday party at the Osmaston Park Hotel, Derby. About 50 members and guests attended this supper and social. Membership of the Society is open to employees of the firm and meetings are held each fortnight at Ley's Works Institute.

TWO EXPERIMENTAL STATIONS had been set up by the West Midlands Gas Board at Saltley and Solihull, near Birmingham, where gas was being produced experimentally from black residual oil without the use of coal, according to the Minister of Fuel and Power, Mr. Geoffrey Lloyd. Production on a large scale was to start shortly at a new plant at Stafford.

E. H. SHUTTLER & SON, brass, gunmetal and aluminium founders, propose moving their factory from Seven Kings, Essex, to a site at Station Approach, Littlestone, Kent, in the Borough of New Romney. The New Romney Borough Council have expressed concern at the housing position in the district and are to make enquiries as to the possibility of exchanges.

THE BIGGEST SHIP ever built on Tees-side, a steam turbine tanker, of 32,000 tons, dw., is due to be launched from Haverton Hill yard of the Furness Shipbuilding Company, Limited. The owners, Gulf Oil Corporation, of New York, have a sister ship on order from the same builders, who have also contracted to build four other tankers of similar size for other owners.

"SCOTLAND MAKES just about everything." That is the observation made by Mr. C. A. Oakley, Controller for Scotland of the Board of Trade, in a book he recently edited entitled "Scottish Industry: An Account of What Scotland Makes and Where She Makes It." The book was published recently under

(*Continued on page* 768)

News in Brief

(*Continued from page* 767)

the auspices of the Scottish Council (Development and Industry), price 25s.

A NEW FACTORY covering an area of 10,000 sq. ft. is to be built for the Peterhead Manufacturing Company Limited. Over 100 men, all from Peterhead and district, will work in the new factory, which will make gear-boxes and similar products. Building will start at once by Scottish Industrial Estates Limited, and the firm expect to have the factory—an extension of the existing one—operating in the Spring.

THE PRESENTATION of either a watch or a cheque was made by the management to nine workers at the Froghall (Staffs) works of Thomas Bolton & Sons, Limited, copper smelters and refiners, etc., to mark their completion of 50 years' service. There were 33 men who have completed half a century in the firm's employ present at the ceremony, but many received their presentations privately earlier in the year.

NEW OFFICES for Pollock Brown & Company, Limited, one of the "600" Group of companies and the southern counties' largest scrap enterprise were opened on November 26 by Mr. Harold G. Cohen, the company's chairman and a director of George Cohen Sons & Company, Limited, the Group's parent. The new building replaces the offices partially destroyed by bombs in 1941 and stands at the entrance of the premises of the company at Northam, Southampton.

F. E. WEATHERILL, LIMITED, Union Row, London, N.17, manufacturers of the "Weatherill" range of hydraulic loading shovels, announce that they have been appointed main distributors for Great Britain and all territories overseas for the "Epping Auto-Shunter" which was successfully introduced by the manufacturers, Epping Engineers, Limited, some six months ago. Mr. J. E. T. Watson, sales manager for Chaseside Engineering Company, Limited, since 1948 until recently, has now joined this company in a similar capacity.

THE PROJECTILE & ENGINEERING COMPANY has held another annual long service dinner at the Ardington Rooms, Clapham Junction, with Sir Lynden Macassey, K.B.E., Q.C., one of the directors, in the chair. At the dinner six gold watches were given to members of the firm who had completed 25 years' service. This now brings the total of employees who have served with the company for 25 years or more to 78. The company also distributed badges to all the recipients of gold watches, as a sign of membership of the PECO 25 Club, composed of all these long-service employees. It is anticipated that the club will now meet annually to celebrate.

SIR HUGH CHANCE urged more firms to release their young employees for general education in working hours, when he addressed a conference in Birmingham arranged by the West Midlands Group of the British Association for Commercial and Industrial Education on the theme "Day Release of Young Employees for Further Education." Sir Arthur P. M. Fleming, director of the Research and Education Committee of Associated Electrical Industries, Limited, said that in his own firm the principle of day release applied to every grade and age of worker. The scheme had operated for the past 50 years and of the 24,000 employees, about 2,400 were taking part.

SPEAKING ON "An approach to maintenance" at a joint meeting of the Yorkshire section of the Textile Institute and the Dewsbury Textile Society at Dewsbury early this month, Mr. H. Brookes, of Bradford, stressed that maintenance shops could not afford to be equipped with out-of-date machinery. If the management expected to do a good job of production there must be comparable equipment and facilities. He urged managements to organize maintenance as an equal partner with production, because much overlapping of responsibilities and misunderstandings could occur if the duties of the maintenance and production staffs were not clearly defined.

MR. W. B. LAWRIE,, M.SC., gave a joint paper with MR. W. A. ATTWOOD, M.A., A.M.I.MECH.E., on the subject of "The Formation and Prevention of Atmospheric Contamination in Factories" to the Manchester Association of Engineers recently. They described the efforts being made, both in the fields of pure research and technology, to discover new processes, or to adapt old ones, both to collect dust when formed and to eliminate it by the introduction of superior methods. They quoted the methods developed in this field and extensively publicized in this JOURNAL and concluded that further research into the whole subject of dust suppression was essential. Both speakers are H.M. Engineering Inspectors of Factories.

THE GROWING INTEREST of Singer Motors Limited in components for aircraft and in other engineering contracts will in no way diminish attention or energy applied to car manufacture, sales and service—this assurance is given by the company's chairman, Mr. A. E. Hunt, in his statement for the annual meeting to be held in Coventry on December 30. With reference to the production of a lightweight tractor, Mr. Hunt states that the company believes there is a large demand for it, particularly overseas, and in due course manufacture of such a lightweight tractor would usefully occupy part of their resources. Production at present was deliberately limited until they had completely satisfied themselves on all points of its mechanical efficiency.

MR. S. GORDON SLOAN, general sales manager of Rubery, Owen & Company Limited told members of the West Midlands branch of the Institute of Export in Birmingham, that there is little hope of a resumption of normal trading with China. Mr. Sloan was recounting his recent trip to China with 14 other British managers. It was much more likely that trade would have to be done with Government agencies and possibly with Chinese purchasing agencies in this country. The primary need of the Chinese was heavy capital equipment; they did not need consumer goods. One of the main difficulties in trading with China at present was that, as normal commercial relationships did not exist, the only system that could be used was barter, and it was that system which the mission were trying to find a way of by-passing.

MR. CHARLES J. RHODES, director of Joseph Rhodes & Sons, machinery manufacturers, of Wakefield, one of the largest factories in that city, was so annoyed about the one-day token engineering strike, which left him with only two production engineers and one apprentice, that he has decided to withdraw holiday bonus pay which amounts to £14 a year. It was Mr. Rhodes who over 30 years ago had to resign from the Engineering Employers' Federation for introducing a five-day week and granting holidays with pay. More recently, half the annual profits of the firm were shared among the workpeople, but this scheme, having been found impracticable, had been replaced by a system of weekly bonus payments. Mr. Rhodes has made it clear that his decision does not affect these payments. What will be cut are the holiday gifts—£5 at Christmas, £5 at August Bank Holiday, £2 at Easter and £2 at Whitsuntide.

Company Meeting

Hale & Hale (Tipton), Limited

MAINTENANCE OF HIGH QUALITY STANDARDS

Mr. W. Edgar Hale on Nationalization and Rizing Costs

The 17th annual general meeting of Hale & Hale (Tipton), Limited, was held on December 16 at the Station Hotel, Dudley, MR. W. EDGAR HALE, M.I.Mech.E., the chairman, presiding. The following is an extract from his circulated review:—

The profit and loss account of the holding company shows a trading profit of £89,208, which compares with £101,310 for the previous year and a net profit of £29,280, as compared with £39,029.

Your Directors recommend that the final dividend on the ordinary shares should be maintained at the rate of 17½ per cent., less tax, making a total distribution for the year of 25 per cent., less tax.

The consolidated trading profit for the year amounts to £124,469 and compares with £143,717 for the previous year and thus shows a decrease of £19,248. Taxation absorbs £68,093, there is a consolidated net profit of £49,202. Last year the consolidated net profit amounted to £57,408, and there is thus a reduction of approximately £8,000.

The result of the year's trading has not been quite up to the standard of recent years, but on the whole I feel that it is excellent. The very high level of taxation is desperately serious in relation to industry, and while we know that there are certain features of national finance to which the Chancellor of the Exchequer is obliged to pay great respect, nevertheless, it is sincerely to be hoped that in the next Budget there will be some further relief from taxation of business. It is interesting to note that in our own case, and in that of so many other industrial concerns, a very small amount is received by the proprietors in relation to each £1 expended in the particular enterprise. In the case of our own company 98.56 per cent. is required to maintain the financial fabric, and that leaves the balance of 1.44 per cent. to go to the proprietors in the form of dividends.

Sales

Although steady sales were maintained throughout the main part of the past financial year, there was a fall towards the latter part. This fall was mainly due to general conditions throughout the industry, one of the chief factors being the absorption, by large users, of stocks which had accumulated during the war and the years since, throughout the shortage period. This falling off continued for some months, bringing with it an atmosphere of competition which could hardly be regarded as healthy; but conditions are now stabilizing.

The delivery position has considerably improved and we are now in a position to offer a first-class product within a reasonable time. I am pleased to say that the sales are now improving steadily as our materials, both Blackheart malleable iron and "Permalite" are becoming readily available to more and more users. With its greater availability, our high-tensile material "Permalite" is finding considerable favour in an increasing number of trades where steel castings and forgings were previously used. The "Hale" shipbuilding wedge is now finding its way into the world's shipyards, and our exports of this device have increased considerably over the past year. With a first-class material to offer to every user of our castings we can face the future with every confidence.

Subsidiaries

CHATWINS, LIMITED has extended its clientele, and its production of solid-fuel appliances, sold under the trade name of "Sunbeam", have become increasingly better known. The company hold a very heavy order-book, and all things being equal, it can look forward to the future with confidence.

J. & J. WHITEHOUSE (TIPTON), LIMITED—Due to the difficulty of recruiting suitable labour, there has been a falling off of production, despite a good order-book. The position is under constant review of the management and it is hoped improved methods will help production in the future. The company produces cast-iron hollowware for the tropics, and trades under the well-known name of "Phœnix."

It has been a year calling for more managerial skill than has been the case for some years now. There is no gainsaying the fact that we are gradually moving, as a nation, into an era of considerable competition in manufactured commodities of all kinds. Be that as it may, I am convinced that we shall be able to do good business in all the world's markets which are calling for a high standard of quality of material and skill in production.

Our own production is of a very high standard of quality, calling for high degree of skill, which as a firm we are well able to provide and that, I am sure, will hold us in good stead as time goes on. I do not see how it can be possible for our material to be sold at a much lower price than that which has been prevailing for some time now, for the simple reason that our largest purchases which are represented by coal, gas, electricity, and pig-iron, are all supplied by nationalized industries. It is difficult to define the difference between private ownership and nationalization, but there is some psychological aspect of it which renders the whole idea quite useless and of no benefit to anyone. As a rough idea of the increases in price of raw materials and power we have had to face since 1945, I would instance approximate figures as follow:— Pig-iron, 125 per cent., coal, 33 per cent.; electricity, 39 per cent.; and industrial gas, 132 per cent. There is no option in the matter of these increases by the nationalized industries—we just have to pay them, or go without the supplies.

Nationalization of certain sections of the country's industries has come to stay; but they differ from other industries in that the latter have to run at a profit or go out of business. The former appear in certain circumstances to be able to be run at losses and to recover these losses by increasing their prices *ad lib.* It is certain that private industry would wither under such management. It is certain that if prices of our raw materials and power go on increasing, then we, in company with others cannot help but raise our own prices. This, I believe, would be disastrous, for a large portion of our production is absorbed by many customers who are trying to maintain a firm foothold in the world's markets by way of exports from this country. In any case, it has to be realized, as far as we ourselves are concerned, that if costs of raw materials and power supply keep increasing, coupled with the cost of wages which cannot be lowered, reduced prices of our manufactures can only come about by a serious reduction in working profit. In such a case we may well find it difficult to maintain our plant and equipment in the first-class condition we have done up to now. Further, from the Chancellor of the Exchequer's point of view, we shall have less to contribute to the national funds.

The report was adopted.

Raw Material Markets

Iron and Steel

Under the Iron and Steel Act, 1953, the Iron and Steel Board was empowered to fix the maximum prices which might be charged in the United Kingdom by iron and steel producers, but could not exercise those powers in respect of any product price-controlled by the Government.

To put the board in a position to exercise its responsibility for the supervision of prices, the Minister of Supply has made an Order bringing to an end all existing iron and steel prices Orders, and at the same time the board has fixed maximum prices covering approximately the same range of products. Except in a few minor instances, no changes in the price schedules have been made.

The board's powers under the Act do not extend to the control of scrap prices. The Iron and Steel Scrap Orders, therefore, are not revoked.

Production of pig-iron is maintained at high levels. Raw materials are adequate for current needs. Deliveries of ore from home and foreign sources meet consumption requirements and provide ample stocks. Although coke is not so plentiful nor the stock position so encouraging, deliveries have been maintained at a rate which has exceeded expectations, removing to some extent the forebodings of the past.

Deliveries of basic pig-iron to the steelworks are on a heavy scale and the furnaces are also maintaining deliveries to the foundries. The past week has given further evidence of a rise in the demand for the high-phosphorus grades from the light and jobbing foundries, and this confirms the improvement in trade in this section of the industry, which has been through a lean and difficult period. There is no intention on the part of the foundries to carry stocks, particularly at this period of the year, and the iron now being called for is needed to fulfil orders actually on the books. Makers of the high-phosphorus irons are generally able to satisfy present demands.

Most of the re-rollers are working short time and they are well supplied with steel semis. Sufficient business for small steel bars and light sections is not available from home sources to keep all the mills fully employed, and trade from abroad appears to have vanished entirely.

The demand for steel plates continues to be in excess of the production and the call for steel is such that delivery dates have had to be further lengthened. Production of heavy sections and joints is maintained, but new orders are not coming in on the same scale.

Non-ferrous Metals

In spite of the approaching year end and Christmas holidays, activity on the Metal Exchange is well maintained, the turnovers in the four metals last week being well up to average. Tin was naturally a good deal influenced by reports from Geneva, where the conference, convened to seek for some means of devising machinery for a measure of price control, was brought to a conclusion. A scheme has been devised which, however, is subject to ratification by the United States Government. Operators seemed to be well enough satisfied with the plan, which includes floor and ceiling prices, for after some fluctuations the week closed with both cash and three months unchanged at £645 and £627 10s. Lead lost ground in the absence of consumer interest, December closing £2 15s. lower and March £2 10s. down on the previous Friday. Zinc was steady and closed without change after a fairly large turnover. Copper is beginning to look rather tired and the forward price has been under some selling pressure. Last week closed with cash £2 10s. down and three months £3 5s. Consumer demand for copper remains good and some interest is now reported for next year when there is a likelihood of United States brands being available. The scarcity of zinc persists and anyone with prompt metal to sell can be sure of securing a premium. High-grade zinc appears to be particularly short at present, especially for nearby delivery, and it looks very much as if some time will elapse before matters come right. It would seem that Canadian electrolytic zinc, which before the war reached the United Kingdom in considerable quantities, is now difficult to obtain.

Another short supply situation exists in scrap, and this difficult position has now been with us for many weeks. It seems to have arisen from the slack period of three or four months which preceded the opening of the copper market when fabricators were not processing semis at anything like the normal rate and, in consequence, scrap arisings were much reduced. Now that manufacturers of semis are busy again the scrap is not forthcoming and this has doubtless intensified the demand for virgin zinc and probably for copper, also. Prices are relatively very high and in due course this will put matters right and we shall see a more satisfactory state of affairs. In the meanwhile a certain amount of American brass scrap is being shipped to the United Kingdom.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* December 10, £234 10s. to £235; December 11, £231 10s. to £232 10s.; December 14, £227 10s. to £228 10s.; December 15, £229 to £230.

Three Months: December 10, £224 5s. to £224 10s.; December 11, £222 5s. to £222 15s.; December 14, £218 to £218 10s.; December 15, £219 to £219 10s.

TIN, Standard—*Cash:* December 10, £655 to £660; December 11, £645 to £650; December 14, £637 10s. to £640; December 15, £660 to £662 10s.

Three Months: December 10, £640 to £642 10s.; December 11, £630 to £635; December 14, £617 10s. to £620; December 15, £627 10s. to £630.

ZINC—*December:* December 10, £74 5s. to £74 10s.; December 11, £74 10s. to £74 15s.; December 14, £73 17s. 6d. to £74; December 15, £74 5s. to £74 10s.

March: December 10, £74 to £74 5s.; December 11, £74 5s. to £74 7s. 6d.; December 14, £73 10s. to £73 12s. 6d.; December 15, £73 15s. to £74.

LEAD—*December:* December 10, £90 5s. to £90 15s.; December 11, £90 15s. to £91; December 14, £89 15s. to £90; December 15, £89 17s. 6d. to £90.

March: December 10, £88 10s. to £88 15s.; December 11, £88 10s. to £88 15s.; December 14, £87 15s. to £88 5s.; December 15, £88 to £88 5s.

Wright Brothers' Jubilee Exhibition

A special exhibition commemorating the 50th anniversary of the first successful flight by the Wright aeroplane in 1903 opened at the Science Museum on December 15. Models, books, aeronautical relics and diagrams are to be displayed illustrating early contemporary thoughts and ideas on powered flight by a man-carrying machine; and how this was ultimately achieved by Wilbur and Orville Wright on December 17, 1903. A series of 16 large, and in some cases dramatic photographs emphasizes the many hazards faced by the early aeronautical pioneer. The exhibition will remain open (weekdays 10 a.m. to 6 p.m., Sundays 2.30 to 6 p.m.) for approximately three months, excluding Christmas day.

R.C.849 is a castable refractory that can be poured behind shuttering or placed in moulds in exactly the same way as ordinary concrete.
It is ready for service twenty-four hours after pouring. Setting, drying and firing shrinkage is practically nil. It has a high cold strength; which is increased by firing at 1350°C. It does not spall even under wide and rapid variations in temperature.

Physical Properties	
Maximum service temperature	1350°C
Density: Green	130 lb/cu. ft.
After firing at 1350°C	120 lb./cu. ft.
Cold crushing strength: Green	3360 lb/sq. in.
After firing at 1350°C	4480 lb/sq. in.
Refractoriness	Cone 19 (1520°C)
After-contraction ...	Not measurable after firing at 1350°C.

Other Morgan refractories include: M.R. PLASTIC MOULDABLE — a mouldable high-alumina refractory material for temperatures up to 1650°C (3002°F); M.I.22 INSULATING CONCRETE. The M.I.28 LOW-STORAGE INSULATING REFRACTORY for temperatures up to 2800°F (1538°C) and the M.R.I.— SUPER-DUTY REFRACTORY which is stable up to 1600°C (2912°F).
Literature will be sent on request.

MORGAN Refractories

ARE WORTH FAR MORE THAN THEY COST

THE MORGAN CRUCIBLE COMPANY LTD

(Refractories Group), Neston, Wirral, Cheshire. Telephone: Neston 1406
M.E.33

Who is gumming up the works?

Could it be you? Are you sticking to scrap that should be on its way to the steelworks?

Don't assume that because steel is not one of your raw materials you have no scrap in your factory. Old machinery is scrap. Whatever you make you must have scrap — scrap iron and steel.

Search your works. Turn out your scrap. Every ton you find will make a ton of new steel.

What is scrap?
All iron and steel that has outlived its effective purpose.

Where should it go?
To your local scrap merchant. He will be glad to help with the dismantling and removal of obsolete plant and machinery.

Issued for the STEEL SCRAP DRIVE by the British Iron and Steel Federation and the National Federation of Scrap Iron, Steel and Metal Merchants.

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

December 15, 1953

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 18s. 0d.; Birmingham, £13 11s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £16 14s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £17 0s. 3d.

Scotch Iron.—No. 3 foundry, £16 11s. 0d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £18 3s. 0d.; South Zone, £18 5s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £19 3s. 0d.; South Zone, £19 5s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £16 12s. 0d.; Scotland (Scotch iron), £16 18s. 6d.; Sheffield, £17 13s. 0d.; Birmingham, £17 19s. 6d.; Wales (Welsh iron), £16 18s. 6d.

Basic Pig-iron.—£14 6s. 6d. all districts.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*).

Ferro-silicon (6-ton lots).—40/55 per cent., £53 10s. 0d., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £82 10s. 0d., basis 75 per cent. Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £165 0s. 0d. to £181 0s. 0d. per ton; 38/40 per cent., £229 0s. 0d. to £235 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 13s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 16s. 6d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s. 0d., basis 60 per cent. Cr, scale 28s. 3d. per unit; 6/8 per cent. C, £80 17s. 0d., basis 60 per cent. Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. 0½d. per lb. Cr; max. 1 per cent. C, 2s. 1d. per lb. Cr; max. 0.15 per cent. C, 2s. 2d. per lb. Cr; max. 0.10 per cent. C, 2s. 2¼d. per lb. Cr; max. 0.06 per cent. C, 2s. 2½d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. 0d. per lb.

Metallic Chromium.—98/99 per cent., 6s. 3d. to 6s. 9d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 12s. 6d.: tested, 0.08 to 0.25 per cent. C (100-ton lots), £26 2s. 6d.; hard (0.42 to 0.60 per cent. C), £28 0s. 0d.; silico-manganese, £33 16s. 0d.; free-cutting, £28 16s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 12s. 0d.; case-hardening, £33 0s. 0d.; silico-manganese, £34 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic soft up to 0.25 per cent. C, £29 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 0s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £30 6s. 6d.; boiler plates (N.-E. Coast), £31 14s. 0d.; floor plates (N.-E. Coast), £31 15s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £28 9s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 4s. 6d.; flats, 5 in. wide and under, £32 4s. 6d.; hoop and strip, £32 19s. 6d.; black sheets, 17/20 g., £41 6s. 0d.; galvanized corrugated sheets, 24 g., £49 19s. 6d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £51 14s. 3d.; nickel-chrome, £73 3s. 6d.; nickel-chrome-molybdenum, £80 18s. 3d.

NON-FERROUS METALS

Copper.—Cash, £229 0s. 0d. to £230 0s. 0d.; three months, £219 0s. 0d. to £219 10s. 0d.; settlement, £230 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 27¼d. per lb.; wire, 261s. 6d per cwt. basis; 20 s.w.g., 290s. 6d. per cwt.

Tin.—Cash, £660 0s. 0d. to £662 10s. 0d.: three months, £627 10s. 0d. to £630 0s. 0d.; settlement, £660 0s. 0d.

Zinc.—December, £74 5s. 0d. to £74 10s. 0d.; March, £73 15s. 0d. to £74 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £103 5s. 0d.; rolled zinc (boiler plates), all English destinations, £101 0s. 0d.; zinc oxide (Red Seal), d/d buyers premises, £90 0s. 0d.

Lead (Refined Pig).—December, £89 17s. 6d. to £90 0s. 0d.; March, £88 0s. 0d. to £88 5s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 22¼d. per lb.; rods, drawn, 32¾d.; sheets to 10 w.g., 249s. 3d. per cwt.; wire, 29¾d.; rolled metal, 236s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £165 to £169; B6 (85/15), £205 to £210; BS249, £186 to £190.

Brass (High Tensile).—BS 1400, HTB1 (30 tons), £196 to £205; HTB2 (38 tons), £205 to £210; HTB3 (48 tons), £214 to £220.

Gunmetal.—RCH, 3/4 per cent tin, £190 to £195; BS 1400, LG2 (85/5/5/5), £195 to £200; LG3 (86/7/5/2), £205 to £210; G1 (88/10/2/½), £260 to £262; (88/10/2/1), £252 to £257.

Phosphor Bronze.—BS 1400, PB1 (AID released), £278 to £285 per ton; strip, 348s. 6d. per cwt.; sheets to 10 w.g., 370s. 3d. per cwt.; wire, 44⅛d. per lb.; rods, 38¾d.; tubes, 37d.; chill cast bars: solids 41d., cored 42d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × .056, 3s. 0¾d. per lb.; round wire, 10g., in. coils (10 per cent.), 3s. 6d.; special quality turning rod, 10 per cent.; ½ in. dia., in straight lengths, 3s. 5d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 10½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex warehouse, £61 15s. 0d. Nickel, £483 0s. 0d. Aluminium, ingots, £150 0s. 0d.; aluminium bronze (BS 1400), AB1, £249 to £254, AB2, £260 to £265. Solder, brazing, BS 1845, 2s. 1b.; granulated, 2s. 3d. lb.

Imports and Exports of Iron and Steel in October

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in October. Figures for the same month in 1952 are given for the purpose of comparison, and totals for the ten months of 1952 and 1953 are also included. (All figures in tons.)

Total Exports of Iron and Steel and Destination

Destination.	Month ended October 31.		Ten months ended October 31.	
	1952.	1953.	1952.	1953.
Channel Islands	624	898	5,681	5,816
Gibraltar	69	30	1,546	1,331
Malta and Gozo	172	196	1,885	3,583
Cyprus	819	506	5,537	8,656
Sierra Leone	376	907	4,230	8,423
Gold Coast	4,646	4,223	30,984	35,636
Nigeria	6,393	7,845	40,464	53,259
Union of South Africa	9,961	5,198	112,495	94,314
Northern Rhodesia	2,885	999	23,835	18,162
Southern Rhodesia	7,683	4,447	47,808	57,419
Tanganyika	2,005	495	17,733	15,530
Kenya	4,470	9,049	36,419	70,758
Uganda	775	957	5,663	10,108
Mauritius	403	692	4,765	7,304
Bahrein, Qatar, and Trucial Oman	2,746	2,418	15,879	24,709
Kuwait	1,353	686	12,180	21,820
India	7,345	8,512	62,437	72,516
Pakistan	4,913	3,821	58,924	30,941
Malaya	7,972	7,094	63,477	61,381
Ceylon	2,121	2,107	19,093	20,813
North Borneo	374	1,303	3,132	5,550
Hongkong	3,287	1,962	20,468	25,368
Australia	26,352	17,306	251,514	140,664
New Zealand	13,407	10,501	123,139	103,122
Canada	17,951	27,579	158,615	177,498
Jamaica	2,587	2,519	22,979	16,513
Trinidad	4,498	3,999	38,273	37,191
British Guiana	132	440	4,664	5,432
Anglo-Egyptian Sudan	1,928	1,567	16,165	22,208
Other Commonwealth	4,539	5,668	28,942	60,207
Eire	5,971	6,083	52,972	50,208
Soviet Union	1,004	1,000	2,041	1,012
Finland	2,644	2,983	42,449	25,085
Sweden	8,865	8,365	94,788	68,956
Norway	5,120	9,646	52,151	64,576
Iceland	230	308	2,495	3,347
Denmark	4,121	11,808	62,294	84,115
Poland	45	71	133	720
West Germany	281	175	1,372	6,474
Netherlands	8,739	14,329	85,259	120,674
Belgium	1,124	3,230	7,220	22,778
France	1,670	1,349	3,685	11,570
Switzerland	956	1,284	7,755	10,665
Portugal	612	1,012	7,904	14,117
Spain	132	445	7,002	5,046
Italy	2,139	3,542	10,810	55,766
Austria	74	191	470	1,331
Yugoslavia	391	1,528	4,015	6,247
Greece	370	922	2,933	14,786
Turkey	673	3,168	7,143	12,228
Netherlands Antilles	954	1,903	12,932	10,122
Belgian Congo	146	362	2,434	2,688
Angola	159	271	2,699	6,584
Portuguese E. Africa	733	231	4,098	2,659
Canary Islands	45	14	607	473
Syria	110	612	1,886	2,525
Lebanon	336	100	8,763	4,505
Israel	886	2,153	12,309	8,662
Egypt	3,603	3,297	29,999	24,530
Saudi Arabia	916	659	6,421	4,702
Iraq	4,298	3,480	41,196	64,144
Iran	763	258	8,416	3,152
Burma	984	1,895	10,332	19,406
Thailand	2,461	697	10,073	9,579
Indonesia	2,519	1,606	14,039	13,907
China	6	—	279	703
Philippine Republic	2	197	4,044	3,286
U.S.A.	7,199	6,727	43,413	89,527
Cuba	143	164	1,861	3,040
Columbia	321	736	3,524	9,360
Venezuela	6,224	4,985	36,360	41,176
Ecuador	214	277	3,520	2,086
Peru	806	772	7,065	9,157
Chile	104	566	2,585	2,804
Brazil	302	11	10,349	2,171
Uruguay	428	1,304	3,997	4,046
Argentina	2,941	528	30,765	10,416
Other foreign	1,553	2,513	20,005	22,079
TOTAL	227,103	241,741	2,036,788	2,173,431

Total Imports of Iron and Steel and Origin

From	Month ended October 31.		Ten months ended October 31.	
	1952.	1953.	1952.	1953.
India	47	1	270	172
Canada	17,370	1,162	133,799	65,614
Other Commonwealth countries and Eire	1,132	20,874	5,540	167,129
Sweden	2,738	5,166	24,739	25,591
Norway	4,390	4,823	53,973	47,558
Western Germany	10,952	991	96,034	35,204
Netherlands	12,859	6,082	139,932	89,039
Belgium	25,543	7,109	256,969	174,116
Luxembourg	21,461	2,172	154,436	88,625
France	34,959	12,359	268,792	217,040
Italy	17	45	9,364	32,217
Austria	42,444	26,613	187,565	393,217
Japan	17,164	217	184,644	56,039
U.S.A.	45,248	554	512,413	112,842
Other foreign countries	9,346	27	15,965	41,958
TOTAL	245,670	88,195	2,045,041	1,546,961
Iron and steel scrap and waste, fit only for the recovery of metal	66,518	60,814	595,173	733,882

Exports of Iron and Steel by Product

Product.	Month ended October 31.		Ten months ended October 31.	
	1952.	1953.	1952.	1953.
Pig-iron	461	592	3,450	4,954
Ferro-tungsten	10	15	92	112
Other ferro-alloys	213	115	2,766	2,152
Ingots, blooms, billets, and slabs	13	232	226	1,107
Iron bars and rods	311	176	2,885	1,553
Wire rods	130	3,382	962	16,301
Bright steel bars	1,885	1,857	12,325	13,886
Alloy steel bars and rods	1,438	1,296	13,384	13,148
Other steel bars and rods	11,104	10,184	95,014	80,949
Angles, shapes, and sections	9,329	10,158	105,520	94,617
Iron and other castings and forgings	744	1,853	9,849	13,461
Girders, beams, joists, and pillars (rolled)	1,892	1,828	27,876	15,630
Hoop and strip	3,589	10,853	39,147	76,464
Iron plates and sheets	1	19	365	295
Tinplate	25,354	25,275	241,615	217,575
Tinned sheets	233	190	1,718	1,534
Terneplate and decorated tinplate	71	49	701	825
Other steel plate (⅛ in. thick and over)	20,973	17,439	195,243	189,739
Galvanized sheets	6,864	13,707	50,521	99,128
Black sheets	14,344	18,024	112,649	165,340
Other coated plates and sheets	829	1,044	9,192	8,043
Cast-iron pipes up to 6 in. dia.	6,865	7,440	72,540	67,571
Do., over 6 in. dia.	5,781	8,608	55,694	57,646
Wrought-iron tubes	43,015	43,264	352,002	368,814
Railway material	19,436	17,154	171,749	201,599
Wire	4,433	5,514	42,621	46,275
Cable and rope	2,732	2,461	25,265	25,223
Wire nails, etc.	1,634	1,552	13,628	16,587
Other nails, tacks, etc.	336	424	4,679	3,720
Rivets and washers	641	316	5,474	3,626
Wood screws	355	248	3,190	1,682
Bolts, nuts, and metal screws	1,493	1,440	18,902	16,256
Baths	471	432	10,569	3,422
Anchors	805	881	8,199	8,257
Chains, etc.	907	811	8,685	7,595
Springs	277	389	4,554	4,150
Holloware	9,414	10,475	74,811	88,551
Doors and windows	1,631	1,565	17,577	15,007
TOTAL, including other manufactures not listed above	227,103	241,741	2,036,788	2,173,431

Board Changes

HEAD, WRIGHTSON & COMPANY, LIMITED—Mr. V. Pendred has left the board.

G. D. PETERS & COMPANY, LIMITED—Mr. J. Oliphant has been appointed a director.

PROJECTILE & ENGINEERING COMPANY, LIMITED—Mr. E. L. Tuff has joined the board.

JAMES BOOTH & COMPANY, LIMITED—Dr. H. W. Clark has been appointed chairman.

DAVY & UNITED ENGINEERING COMPANY, LIMITED—Mr. G. S. McLay has left the board.

ALUMINIUM CASTINGS COMPANY, LIMITED—Mr. John MacNish, a director of the Charterhouse Industrial Development Company, Limited, has been appointed a director to fill the vacancy caused by the death of Mr. R. S. Dyball.

JOSHUA BIGWOOD & SON, LIMITED, the Wolverhampton engineers and ironfounders—Mr. A. E. Pingree, secretary of the company for seven years, has been appointed financial director, and Mr. E. L. Tinley, chief engineer, becomes technical director.

CROFTS ENGINEERS, LIMITED—Sir Arthur Croft has retired from the position of managing director, but is to remain as chairman. Mr. J. A. Croft has been appointed deputy chairman, and Mr. M. Goff and Mr. H. Matthews have been appointed joint managing directors.

MONSANTO CHEMICALS LIMITED—Mr. D. R. Mackie, director, and at present also general manager of sales, is to be commercial director. The position of general manager of sales is to be discontinued and the responsibilities of that office transferred to three sales controllers, Mr. E. L. Pixton, Mr. D. C. M. Salt, and Mr. J. S. Hunter.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

BOOTLE (LANCS), January 9—Supply of manhole covers, gully grates, nails, rivets, and screws, for the 12 months commencing April 1, 1954, for the Borough Council. The Borough Surveyor, Town Hall, Bootle.

BIRKENHEAD, January 4—Supply of iron castings for the 12 months ending March 31, 1955, for the Borough Council. The Borough Engineer and Surveyor, 3, Conway Street, Birkenhead.

EALING, January 18—Supply of iron castings, and lamp and ventilating columns, for the Borough Council. The Borough Engineer and Surveyor, Town Hall, Ealing, London, W.5.

ELLAND (YORKS), January 9—Supply of cast-iron gully grates and frames, and manhole frames and covers, for the Urban District Council. Mr. F. R. Birkhead, engineer and surveyor, Council Offices, Elland.

ILFORD, January 4—Supply of iron castings, iron, nails, screws, etc., for the 12 months ending March 31, 1955, for the Borough Council. Mr. L. E. J. Reynolds, borough engineer and surveyor, Town Hall, Ilford. (Fee, 1s.)

Recent Wills

NEGRETTI, P. E., chairman and managing director of Negretti & Zambra, Limited, scientific instrument manufacturers, of London, W.1 ... ... £188,624

JONES, DR. BERNARD MOUAT, formerly Vice-Chancellor of Leeds University and before that Principal of Manchester College of Technology £26,265

ABERCONWAY, LORD HENRY DUNCAN MCLAREN, chairman of John Brown & Company, Limited, English Clays Lovering Pochin & Company, Limited, Tredegar Iron & Coal Company, Limited, and Firth Brown Tools, Limited, and interested in other companies £265,777

CLASSIFIED ADVERTISEMENTS

PREPAID RATES : **Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Numbers 2s. extra (including postage of replies).**

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, 49, Wellington Street, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATION WANTED

ENGINEERS' PATTERNMAKER (35), sound technical, practical, and foundry experience, organising ability, wishes to contact Proprietor or Manager requiring conscientious Assistant.—Box EP130, FOUNDRY TRADE JOURNAL.

ENERGETIC young Man, 7 years' experience in Foundry progress and production control, seeks position, with opportunity for advancement.—Box EY102, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE—Qualified Metallurgist and Foundryman (34), desires position with progressive company requiring hardworking and active representative, resident Sheffield.—Box T.R. 131, FOUNDRY TRADE JOURNAL.

FOUNDRY WORKS MANAGER (M.I.B.F.), age 45, sound practical experience modern methods of high production in Blackheart, Malleable, Grey Iron, Chilled, Roll and Non-Ferrous Castings.—Box F.W. 132, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order,* 1952.

INSPECTOR wanted for Mechanised Foundry. Staff appointment.—Write, stating age, experience, and salary required.—Box IW113, FOUNDRY TRADE JOURNAL.

ASSISTANT WORKS MANAGER required for well-known cooker factory in Midlands. Applicants must be about 30 years of age, and have foundry, vitreous enamelling, machine shop experience. State training, experience, and salary required to Box 3919, FOUNDRY TRADE JOURNAL.

IRON FOUNDRY SUPERINTENDENT required by well-known Midland engineering company. Applicants should have sound metallurgical training, and knowledge of modern techniques relating to production of approximately 50 tons/week high duty and general engineering castings.—Box 3910, FOUNDRY TRADE JOURNAL.

HIGHLY qualified ENGINEER required, to take charge of organisation responsible for design and sales of foundry plant and associated equipment. Post advertised constitutes key position in internationally known group of engineering companies. Applicants are asked to supply details of experience, qualifications, age, etc.—Box 3908, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

STEEL FOUNDRY FOREMAN required Sheffield. Accustomed to high quality product. Age about 35 years. Progressive future for suitable applicant.—Write, giving age and qualifications, to Box SF128, FOUNDRY TRADE JOURNAL.

LABORATORY ASSISTANT required by Metallurgical Department attached to large non-ferrous alloy foundries in the London area. A man with foundry experience will be preferred.—Write, giving full particulars, to Box LA108, FOUNDRY TRADE JOURNAL.

A RAPIDLY expanding IRON FOUNDRY (Malleable and Grey Iron) requires REPRESENTATION in all parts of England and Wales. Generous remuneration and exceptional prospects for capable men with knowledge of Foundry Trade. Applications, which will be treated in strictest confidence, should give details of age and experience.—Write Box 3148, FROST-SMITH ADVG., 64, Finsbury Pavement, London, E.C.2.

BAMFORDS LTD., Agricultural Engineers, Uttoxeter, require Metallurgical Chemist for Foundry producing repetition high duty and light grey iron castings. Applicants should have a sound knowledge of metallurgical analysis and experience in cupola control, sand testing, etc. State age, experience, and present salary.

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SITUATIONS VACANT—*contd.*

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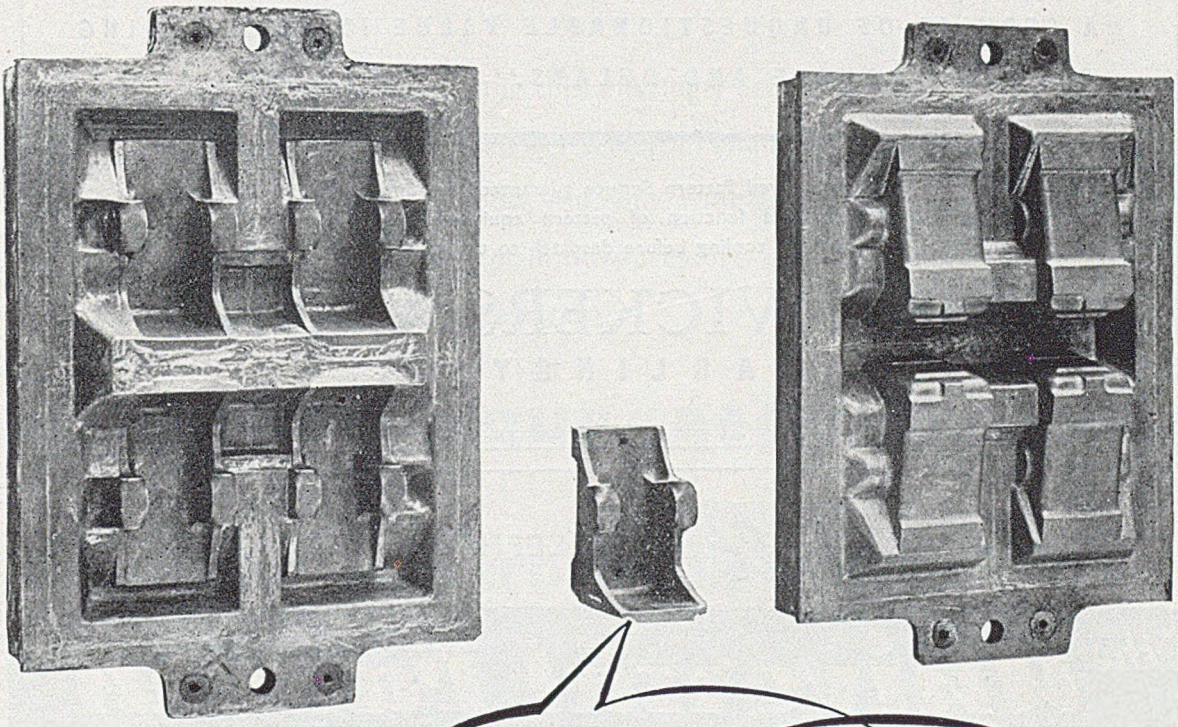

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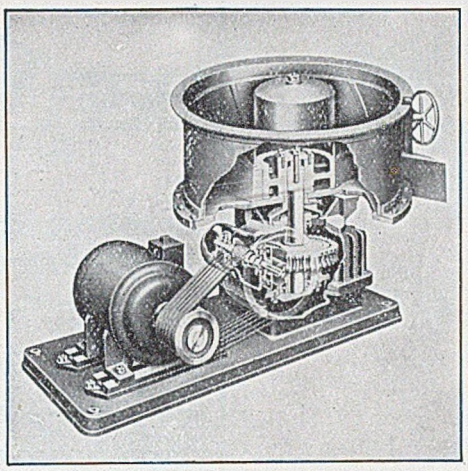

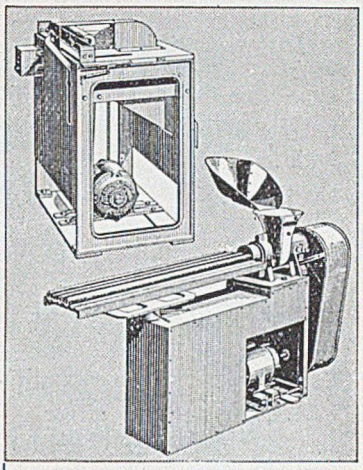

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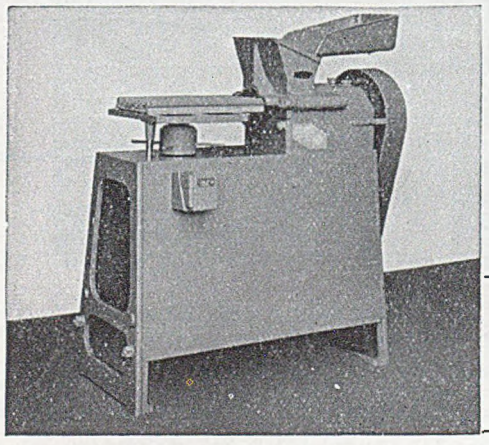

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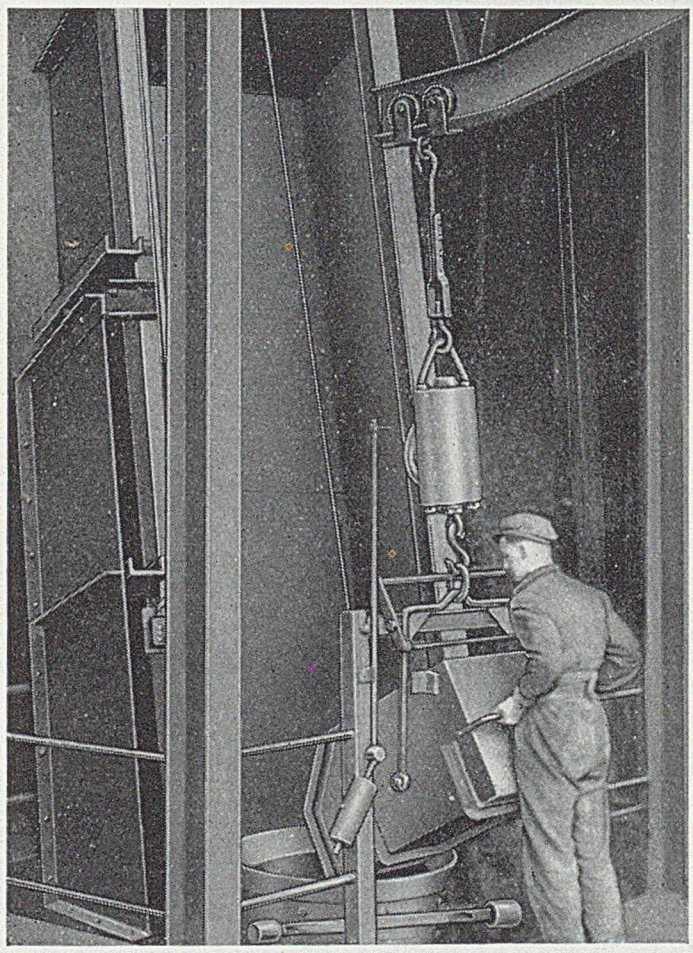

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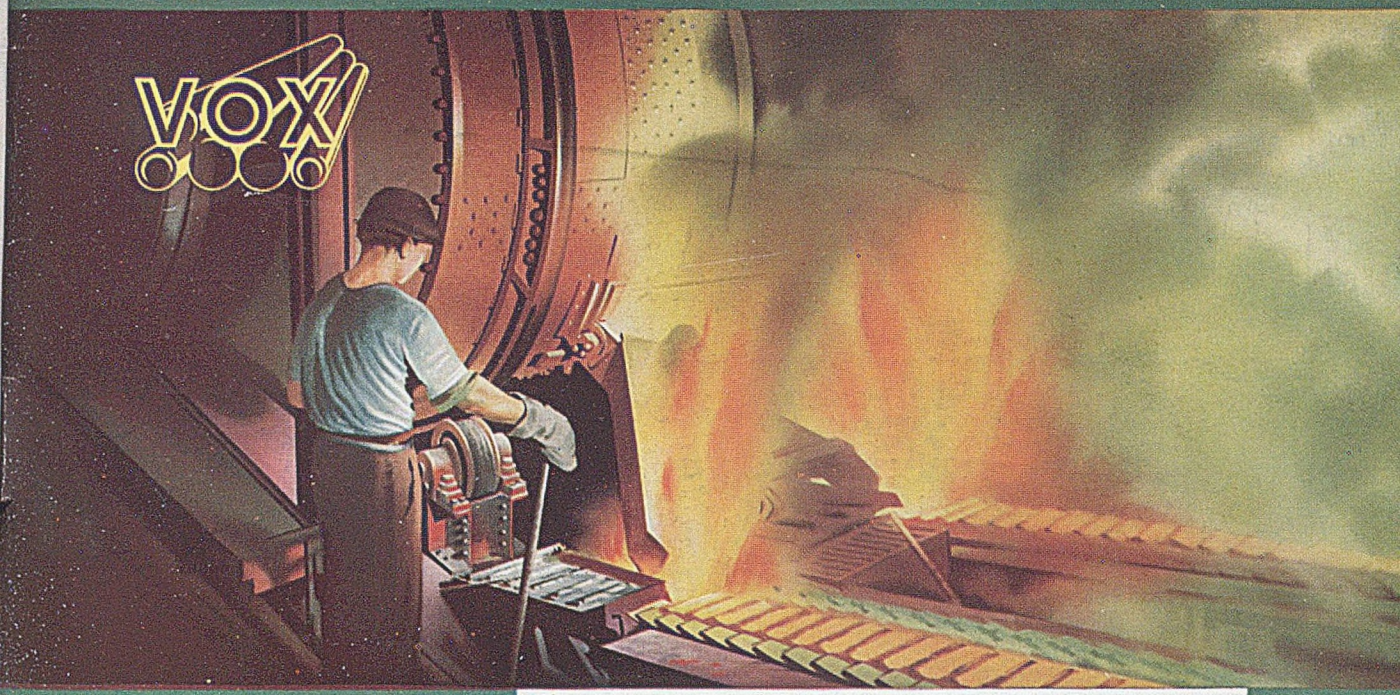

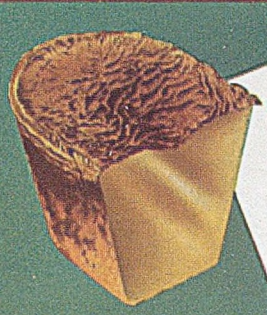

BRASS

SPECIFICATION

BSS 1400 BI-1
BSS 1400 B2-1
BSS 1400 B3-1
BSS 1400 B4-1
BSS 1400 B5-1

ALUMINIUM BRONZE

SPECIFICATION

BSS 1400 ABI-1
or DTD 174A
BSS 1400 AB2-1
or DTD 412

PHOSPHOR BRONZE

SPECIFICATION

2B8 or BSS 1400
PBI-1
BSS 1400 PB2-1
BSS 1400 LB2-1
BSS 1400 LPBI-1

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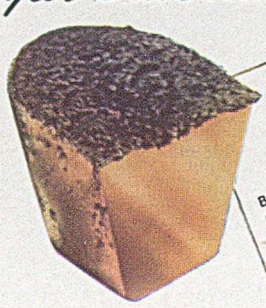

GUNMETAL

SPECIFICATION

BSS 1400 LG2-1
BSS 1400 LG3-1
BSS 1400 G2-1
BSS 1400 GI-1

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